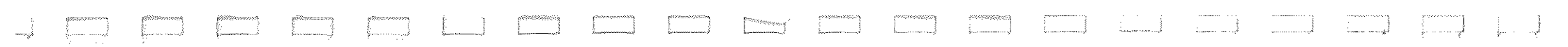
HANDICAP INTERNATIONAL PHYSICAL THERAPY ASSISTANT MANUAL

VOLUME 3

PATHOLOGIES AND PHYSICAL THERAPY TREATMENTS



ACKNOWLEDGEMENTS

The preparation and production of this Manual has only been made possible through the efforts of the Handicap International team in Thailand composed of Physical Therapists, Occupational Therapists, and office support personnel.

During the process of developing appropriate and standardized training courses for Physical Therapy Assistants (PTA), the following key contributors devoted countless hours of both their work and leisure time to the wide range of tasks involved.

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Special appreciation and sincere thanks are due to Luci, Sonia, Myriam, Jean-Christophe, Sumitra, Fred, and Claude for their assistance and hard work in compiling the final product.

Appreciation is also extended to Susan Walker, the Regional Director of Handicap International, for her continued support throughout the project.

The illustrations used in this Manual were assembled from a variety of sources. Some of these illustrations have been modified and others have been directly incorporated. David Werner's publication, "Disabled Village Children", was extensively utilized for this purpose.

Appreciation is extended to all authors listed in the Reference Section provided at the end of each Volume.

INTRODUCTION

Handicap International came to Thailand in 1981 with the purpose of meeting the need for low cost prosthetic devices using appropriate technologies for amputees in camps and evacuation sites along the Thai-Cambodian border. In 1984, Handicap International expanded its operations to include Physical Therapy and rehabilitation. The current program at this border has the objective of training Khmer refugees and displaced persons in the basic techniques of Physical Therapy.

From 1984 to 1988, the expatriates working within this program developed individual course work in each of those camps having a Physical Therapy Assistants (PTA) training program. This process was often very time-consuming. There was little or no continuity between the consecutive missions of the expatriates, and there was no standardization between the different camps in order to integrate the activities of the program as a whole.

In 1989, a decision was made to develop a standardized PTA curriculum in the camps along the border. The team of Physical Therapists and Occupational Therapists working for Handicap International in Thailand cooperated in the preparation and application of this curriculum. This Manual is the result of the first comprehensive attempt at meeting this need.

The manual is composed of 3 Volumes that should preferably be used in the order as numbered. However, the content has been developed in such a way that individual chapters or combinations of chapters may be extracted and applied as self-sufficient units in accordance with the varying needs of each group of users. Examination and evaluation material covering all 3 Volumes is provided as a separately bound document.

In order to avoid confusion in terminology which may possibly arise from the combination of French, Belgian and American nationals who worked together in the development of the Manual, it should be noted that the following terms are directly interchangeable.

Term used in the Manual	Common European equivalent
Range of Motion (verb)	Mobilization
Range of Motion (noun)	Amplitude
Strengthening	Musculation
Stretching	Posture

In using the Manual in the field, it may be found that certain topic areas are too detailed and others too generalized. As a pilot exercise, the team in Thailand is currently testing the manual in order to identify those areas requiring future modifications.

Through a continuing process of monitoring, evaluation and feedback, it is intended that the Manual may be progressively improved in order to meet the basic training needs of the Physical Therapy Assistant.

All users and other interested individual and groups are invited to send comments, suggestions as well as descriptions of appplication experiences, to:

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May 1990

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24.

FRACTURES

A FRACTURE is a broken bone.

OBJECTIVES

At the time of the exam and with 80% proficiecy, the student will be able to correctly:

1. describe how a fracture heals.
2. identify the bone, and location of a fracture on x-ray.
3. compare simple and compound fractures
4. describe functional positions for the upper and lower limbs and state why they are important.
5. compare positive and negative effects of immobilization.
6. demonstrate appropriate P.T. evaluation and treatment for:
   - patients with different immobilization devices
   - patients that have had immobilization removed

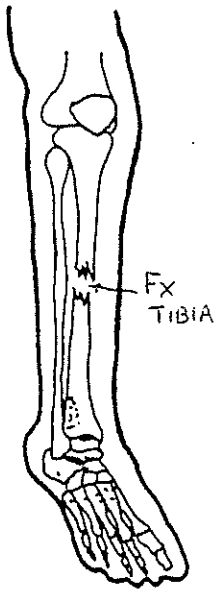
CHAPTER CONTENTS

A. WHAT IS A FRACTURE?

A fracture is a broken bone.

(Example: A "fractured tibia" means the tibia is broken.)

Fx or = fracture
Fx tibia = fractured tibia
tibia = fractured tibia



B. CAUSE OF A FRACTURE

Causes of broken bones are:

disease

trauma

C. SPECIFIC INFORMATION ABOUT A FRACTURE

Fractures are very common. The following information is given to help the PTA better understanding broken bones.

1. Names and Types of Fractures
2. Symptoms and Signs of Fractures
3. Problems a Fracture Can Cause
4. Fracture Healing (How and When)
5. Pseudarthrosis

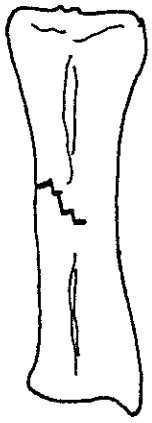
1. Names and Types of Fractures

NAMES OF FRACTURES

Fractures are named by describing the break in the bone.

The PTA will NOT have to remember the names of different fractures. These names are given as a reference only.

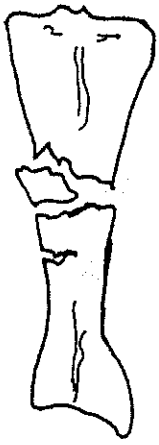
GREENSTICK (partial break of the bone)



TRANSVERSE

OBLIQUE

COMMINUTED (bone is broken into more than two pieces)



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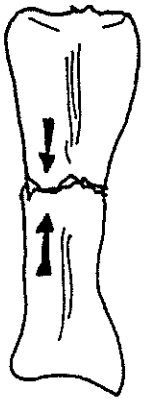

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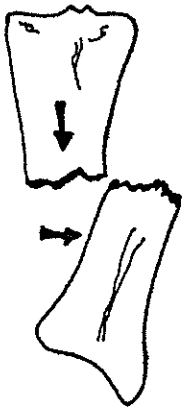

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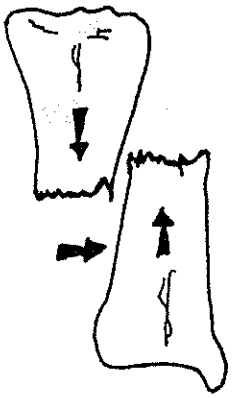


Fractures can be identified by how they look on x-ray.

An x-ray is a type of picture of the inside of your body.

The more dense (hard) parts are white on an x-ray.

If there is a fracture, the white part may look broken, separated, or abnormal.

Activity:

Below are pictures of x-rays. Please put a circle around the area when the bone has been fractured.

TYPES OF FRACTURES

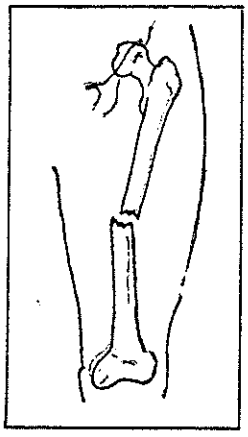
There are two main types of fractures. These are:

a) Closed fracture (Simple fracture)

b) Open fracture (Compound fracture)

a) Closed fracture (Simple fracture)

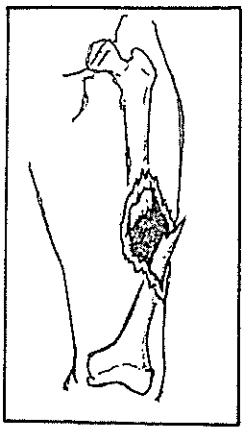
A closure fracture means that broken bone remains inside the skin.



b) Open fracture (Compound fracture)

An open fracture means the skin has been opened in such a way that the broken bone and outside air can meet.

This can happen in two ways:

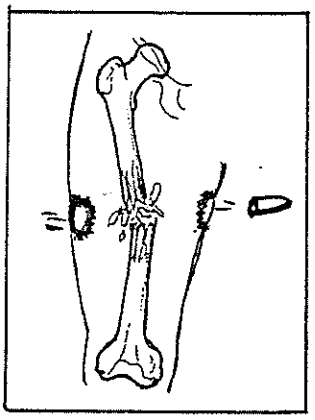


i) Skin is broken from the inside.

(Example: The fractured bone has pushed through the skin.)

ii) Skin is broken from the outside.

(Example: A bullet passes through the skin. This causes a wound and a bone fracture.)



Compound fractures are open doorways for bacteria. They must be kept very clean because they can easily get infected.

Questions:

1. A bone was broken in many places. The skin was not broken. What type of fracture is this (simple or compound)?

   _____

2. Are infections more common in open or closed fractures?

   _____

   Why? _____

   _____

3. You hear a PTA describe a simple fracture as a fracture with a small break in the bone, and a compound fracture as a fracture with many breaks in the bone.
   Do you agree with the description?
   Yes _____ No _____

   Why or why not?

_____

_____

_____

2. Symptoms and Signs of Fractures

After a bone has been broken, the patient may have:

* hear the bone break
* PAIN at the fracture site
* swelling
* limb deformity or unnatural movement

3. Problems a Fracture Can Cause

The two main problems a fracture can cause are:

a) damage to other body parts

b) infection

a) damage to other body parts

When a bone breaks, it may damage body parts that are close to it.

Body parts that can be easily damaged by a broken bone are:

* arteries and veins
* peripheral nerves
* special protected areas

Questions:

1. Many of your ribs are broken. What body part(s) could be damaged by these broken ribs?

_____

_____

2. A man has a fractured humerus. The broken bone cut the motor nerve that controls the wrist extensors. Describe the patient's problem because of this nerve damage.

_____

_____

3. You have a fracture of three vertebrae. What body part could be damaged because of these broken vertebae?

_____

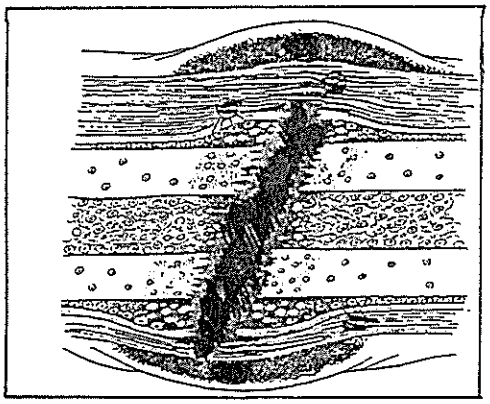
b) infection

Compound fractures can easily become infected if the wound is dirty. Infection causes slower consolidation.

It is very important to keep wounds clean.

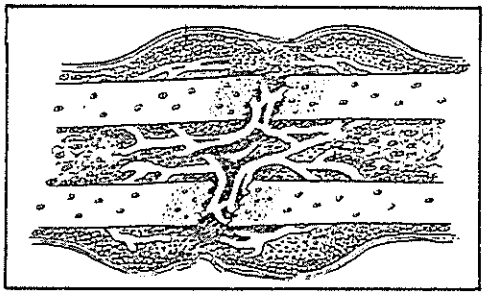
4. Fracture Healing (How and When)

a) HOW does a fracture heal?



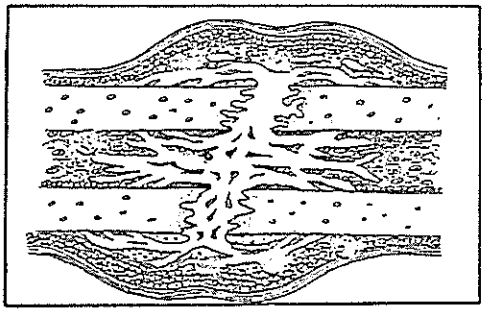
i) When a bone is broken it bleeds.

This bleeding is one reason for the swelling that occurs in a simple fracture.



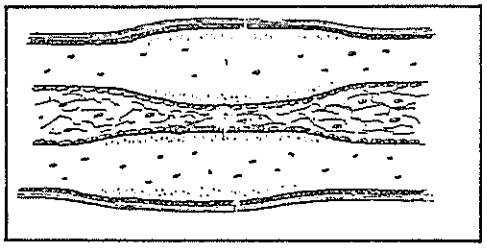
ii) After about two weeks, the inner periosteum will begin to produce new bone. (See OSTEOLOGY chapter, Volume 1.)

This new bone grows and works to join the broken bones together.



iii) In the beginning, this new bone is not very strong and is often called a "callus".

A callus can be seen on x-ray after about 3-5 weeks.



iv) Little by little, bone that is more hard replaces the callus.

When the bone is completely healed, it is called consolidation.

A doctor will decide if the bone has consolidated.

To identify how strong a bone is, the doctor can do two things:

* look at the x-ray

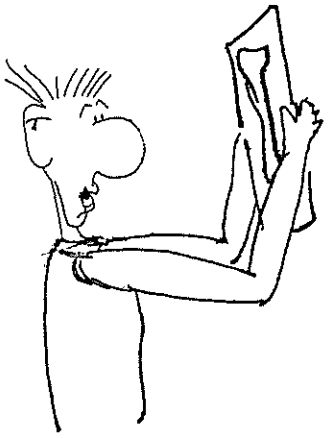
* manually check the patient

* look at the x-ray

The doctor will look at x-rays that were taken at different times to compare them.

He will look to see if the fractured area becomes whiter (harder) with time.

When the doctor thinks that the bone is consolidated, he will manually check the patient.



* manually check the patient

When the x-ray shows that the fractured bone is hard, the doctor will try to move the fractured area with his hands.

Example:

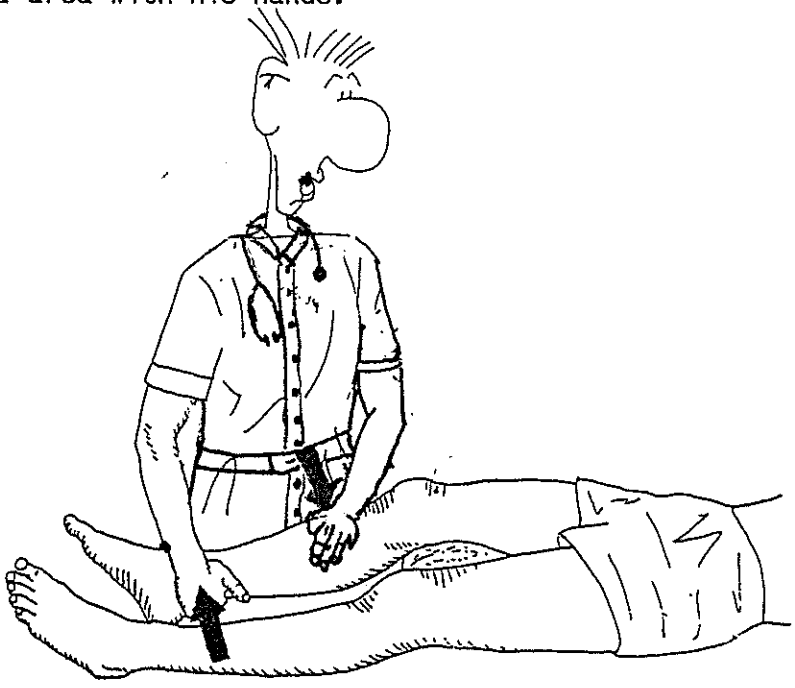
A patient had a fracture of the tibia.

The doctor thinks that the tibia has consolidated.

He will test the tibia to see if it moves when he pushes on the bone.

If the bone moves when he pushes on it, it is not yet consolidated.

If the bone does not move when he pushes on it, the fracture has consolidated.



b) <u>WHEN does a fracture heal</u>?

The amount of time it takes for a fracture to heal (consolidate) depends on the following things:

i) patient age – young people heal faster than older people.

ii) nutrition – good food (milk, rice, vegetables, meat) helps bones consolidate faster.

iii) wound care – if there is infection, the bone will consolidate more slowly.

iv) immobilization – if there is movement at the place where the bones are broken, the bones will not consolidate.

v) blood circulation – bones that have a better blood supply will consolidated faster. (Exercise can increase blood supply to a bone.)

vi) type of fracture – simple Fx heals faster than compound; transverse Fx heals faster than comminuted.

vii) type of bone – see chart (on next page) for details.

<u>Question:</u>

A patient has a fracture. Look at the information above. What four things can a patient do to help a bone heal faster?

_____

_____

_____

_____

GENERAL CONSOLIDATION TIME

Consolidation time depends on the individual patient, but general healing times for different bones can be seen on the chart below.

BODY AREA	GENERAL CONSOLIDATION TIME
upper limb: (humerus, radius, ulna)	ADULT = 1.5 months CHILD = 3 weeks
lower limb: (femur, tibia, fibula)	ADULT = 3 months CHILD = 1.5 months
ribs, scapula, clavicle	1 month
vertebrae: carpals, tarsals	3 months
distal hand (phalanges) distal foot (phalanges)	1.5 months

Question:

A patient has a fractured tibia and a fractured ulna. The tibia healed faster than the ulna. Is this what you would expect?

_____ yes _____ no

Please list three reasons why the tibia had healed faster than the ulna.

_____

_____

_____

5. Pseudarthrosis

Pseudarthrosis are bones that do not consolidate completely even after a long time.

Questions:

1. Please write two reasons why a bone may not grow together.

_____

_____

_____

2. A patient had a fracture of the left femur. After five months the doctor says he has a pseudarthrosis. What does this mean?

_____

_____

Is this a problem for the patient? _____ yes _____ no

Explain your answer. _____

_____

_____

_____

D. MEDICAL TREATMENT OF A FRACTURE

Medical treatment for fractures includes:

1. REDUCTION (put the broken bone in a good position).
2. IMMOBILIZATION (keep the bone in a good position).
3. Decide WEIGHT BEARING status (for lower limb fractures).

In addition, medicine may be given to:

a) decrease pain

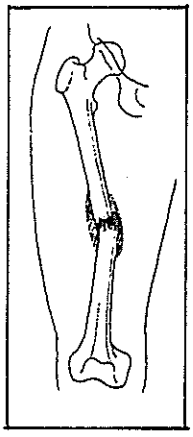
b) prevent infection in open fractures

1. REDUCTION

After a fracture, the broken bone may be in a bad position.

A bad position means that the broken ends of the bone are not in a good line with each other.

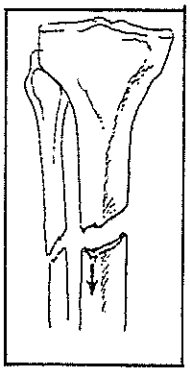
If the bone grows together in a bad position, the limb shape may be abnormal.



REDUCTION is the way to put the broken bone in a good position.

A good position means that the broken ends of the bone are in a straight line with each other.

If the bone grows together in a good position, the limb shape will be normal.



Question:

Reduction is the way to put a broken bone in a good position. All fractures should be in a good position so that the bones can grow together with a normal shape.

Do all fractures need reduction? _____ yes _____ no

Explain your answer. _____

_____

_____

_____

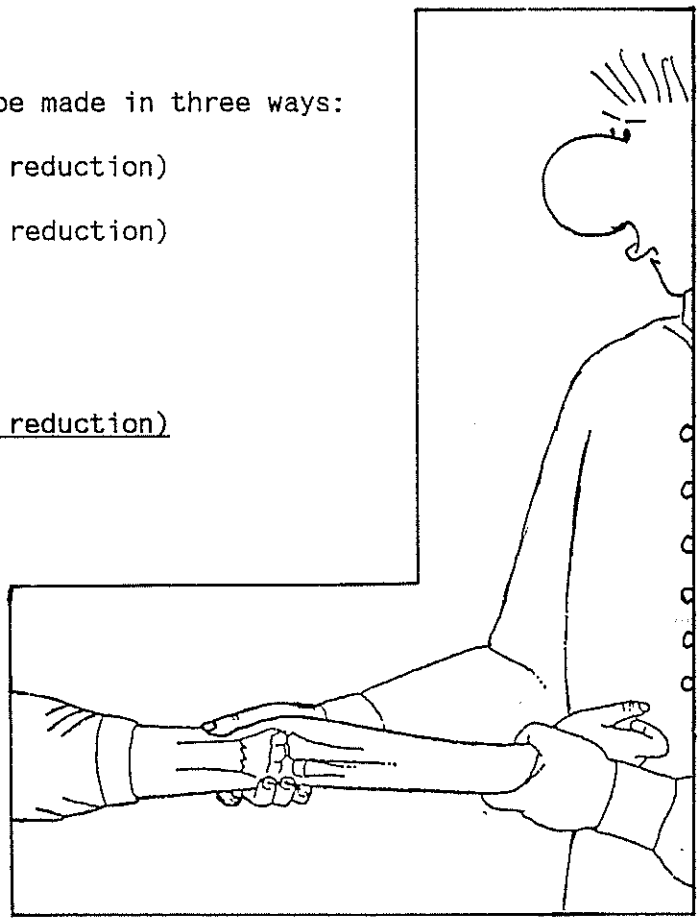
Reduction for fractures can be made in three ways:

a) manual reduction (closed reduction)

b) surgical reduction (open reduction)

c) bone traction

a) manual reduction (closed reduction)



Manual reduction is made by the doctor.

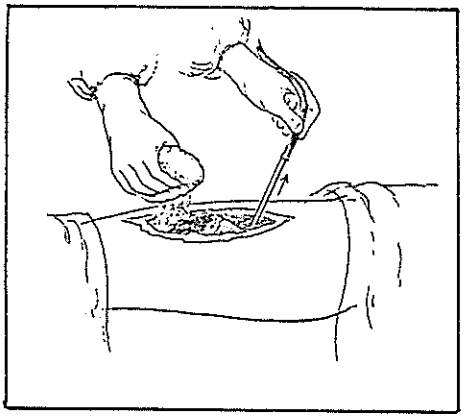
The doctor uses his hands to put the broken bone in a good position.

The skin remains closed.

The doctor positions the broken bone without opening the skin.

This technique is used for simple fractures that can easily be put in a good position.

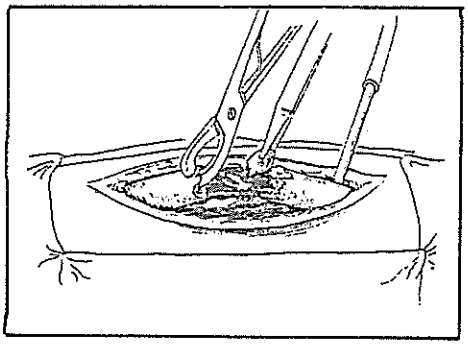
b) <u>surgical reduction (open reduction)</u>



Surgical reduction is made by the doctor.

The doctor uses his hands to put the broken bone in a good position.

The skin covering the fractured bone is open.



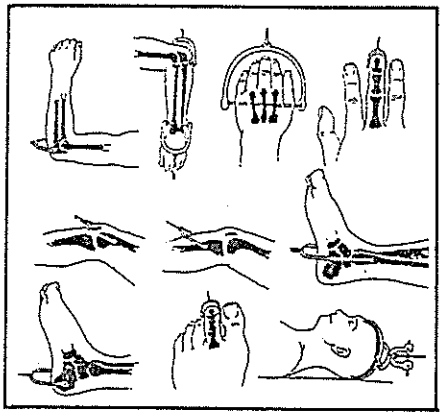
The skin may have been opened because of a compound fracture.

The doctor will clean the fracture area (remove metal or dirt), and then position the bone as well as possible.

c) <u>bone traction</u>

Bone traction is a system (different parts that work together) to to pull overlapping bones into a good position.

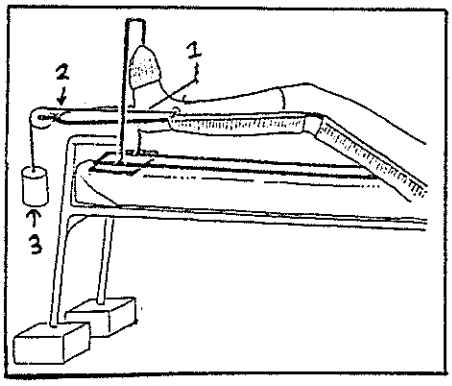
The traction system has three parts:



1) <u>metal</u> attachment to the bone

2) <u>rope</u> attached to the metal and a <u>board</u> that guides the rope to pull the bone in the right direction

3) <u>weight</u> attached to the rope will slowly pull on the bone moving it into a good position.



2. IMMOBILIZATION

Immobilization prevents movements.

With immobilization, the fractured bone stays in a good position.

The different ways to prevent a fractured bone from moving are:

IMMOBILIZE THE JOINTS ABOVE AND BELOW THE FRACTURE.	splint plaster (POP, cast)
IMMOBILIZE THE FRACTURED BONE ONLY	external fixator internal fixator
TRACTION	traction

The type of immobilization used will depend on the type of fracture, the location of the fracture, and the doctor's decision.

The different types of immobilization will be discussed in the following order.

a) splint

b) plaster (POP, cast)

c) external fixator

d) internal fixator

e) traction

a) splint

Immediately after a fracture there is a lot of swelling.

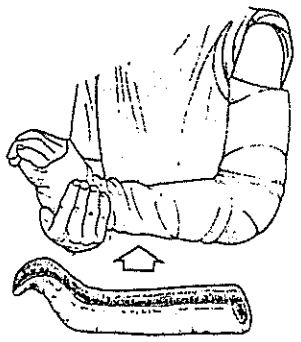
Question:

Please give one reason why there is swelling after a fracture.

_____

_____

A splint is used to immobilize the fracture during the time that there is a lot of swelling.

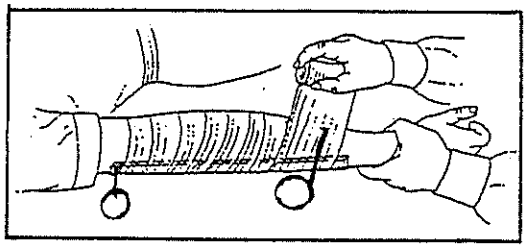


Most often a splint is used for patients that have closed fractures.

A splint is made of two parts:

i) a hard part that fits on the fractured limb.

ii) an elastic bandage that holds the hard part on the limb.



This elastic bandage also helps to decrease swelling by keeping a slight pressure on the area.

After the swelling has decreased, the doctor will use a different type of immobilization that is better at preventing movement for a long time.

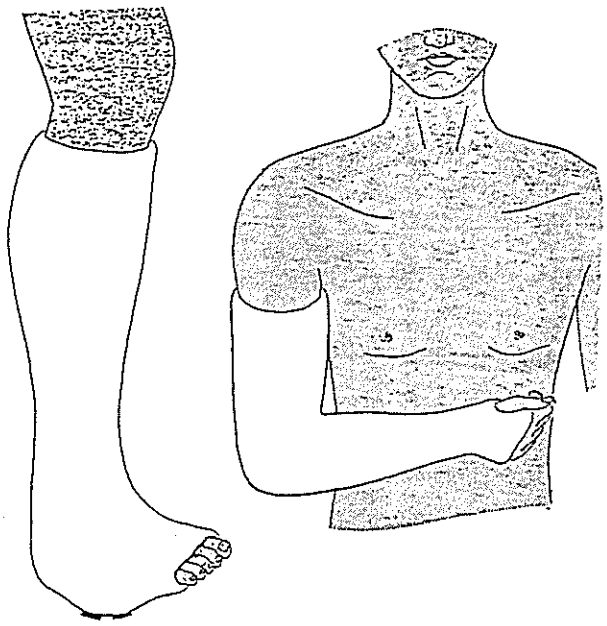
b) <u>plaster (POP, casting)</u> (See PLASTER chapter, Volume 2)

** POP = Plaster Of Paris

Plaster is a material that is very hard when it dries.

After swelling has decreased, plaster is used to immobilize the fracture.

The doctor puts the joints in a <u>functional position</u>; then he wraps the limb with a hard and fast drying material (plaster).



The joints <u>above the fracture</u> and <u>below the fracture</u> must be immobilized with the POP to prevent any movement of the broken bone.

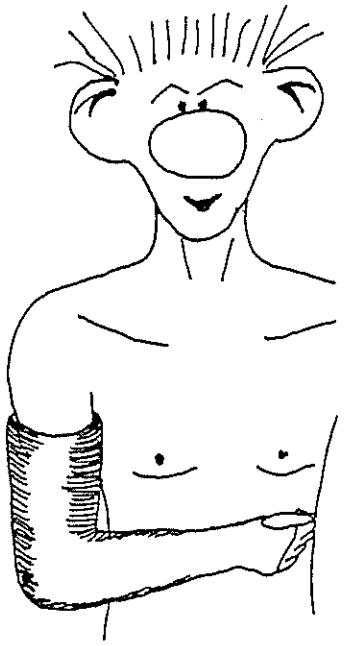
FUNCTIONAL POSITIONS

When the joints are immobilized, they should be immobilized in a functional position.

Functional positions are important because the joint is useful even if there is tightness/stiffness.

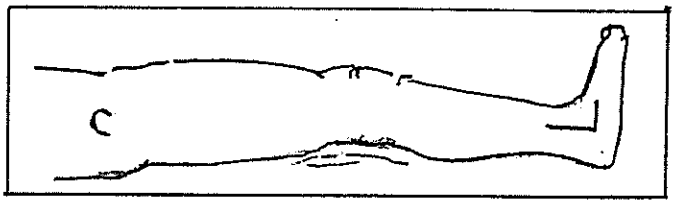
<u>Functional positions</u> for the joints of the UPPER LIMB are:

SHOULDER	a little flexion, abduction, internal rotation
ELBOW	flexion 90°
FOREARM	neutral
WRIST	a little extension
FINGERS	a little flexion
THUMB	opposition



Functional positions for the joints of the LOWER LIMB are

HIP	neutral
KNEE	a little flexion
ANKLE	neutral
FOOT	neutral
TOES	neutral



Questions:

1. The tibia is fractured. What joints should be immobilized by the POP?

_____

2. The right ulna is fractured.

(A) Draw a picture of where to put the POP on the upper limb.

(B) Describe the functional position of the upper limb in the POP.

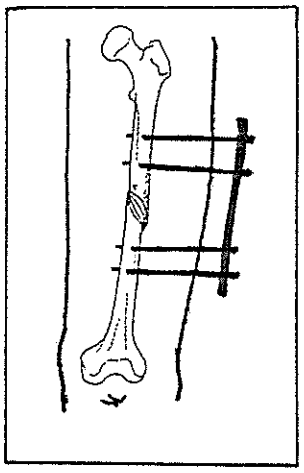
_____

_____

_____

c) <u>external fixator</u>

An external fixator is a type of immobilization that attaches to the bone.



4-6 pins are put into the broken ends of the bone and attach to a metal bar on the <u>outside</u> of the skin.

This type of immobilization is very strong and safe.

The places where the pins enter the skin should be kept very clean to prevent infection.

<u>Question</u>:

A patient has an open fracture and the bone is broken in many places. The doctor uses an external fixator to immobilize the broken bone.
List two reasons why an external fixator may be better than plaster to immobilize this bone.

_____

_____

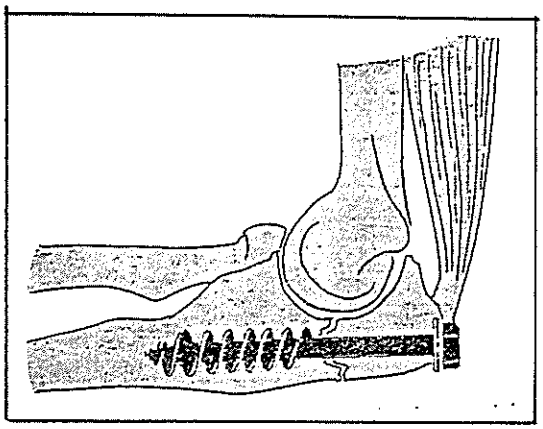
_____

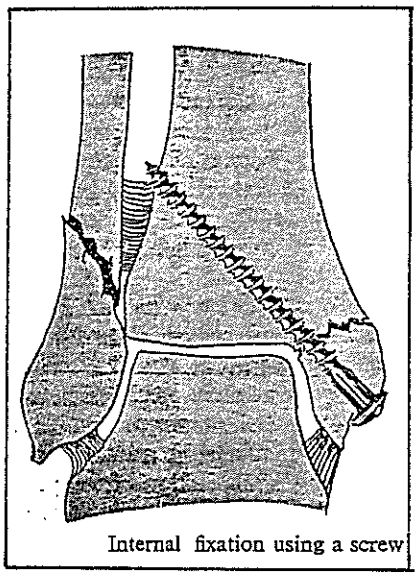
d) <u>internal fixator</u>

An internal fixator is a type of immobilization that attaches directly to the bone.

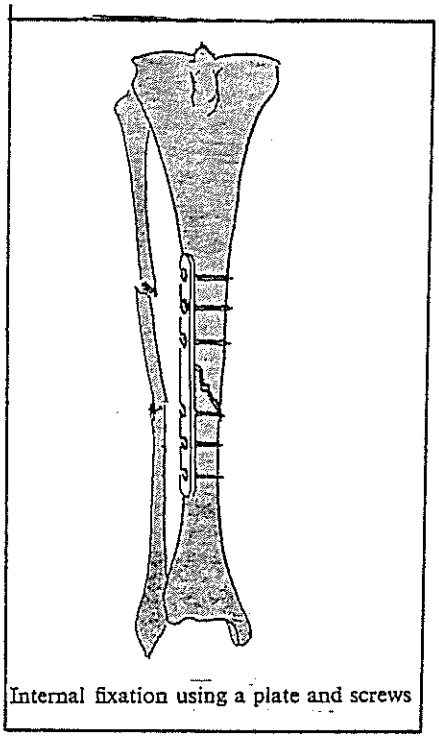
All of the pins and metal are on the <u>inside</u> of the skin.

An internal fixtor can be inside of the bone, or be directly on top of the bone.

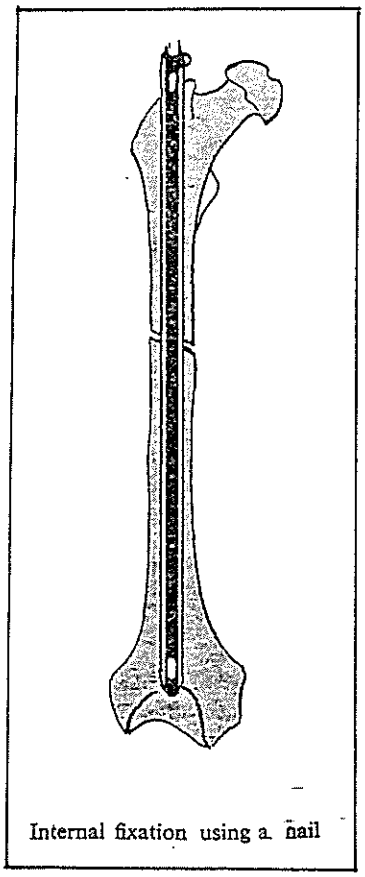




Internal fixation using a screw



Internal fixation using a plate and screws



Internal fixation using a nail

Internal fixators have a HIGH RISK OF INFECTION.

Questions:

1. What is the difference beween an internal fixator and an external fixator?

_____

_____

2. Why are internal fixators not often used in developing countries?

_____

_____

e) traction

Traction was described as a way to make reduction of a fracture.

Traction can also be used as a way to immobilize a fracture until a callus is made (the fractured bone is stable).

After there is a callus, a different type of immobilization may be used.

Questions:

1. What does "make reduction" mean?

_____

_____

_____

Questions: (continued)

2. Please list the three parts of a traction system and describe how they work.

_____

_____

_____

_____

3. WEIGHT BEARING

WEIGHT BEARING is putting some amount of weight through a bone.

Activity:

For each picture given, please write the weight bearing parts.

A. _____

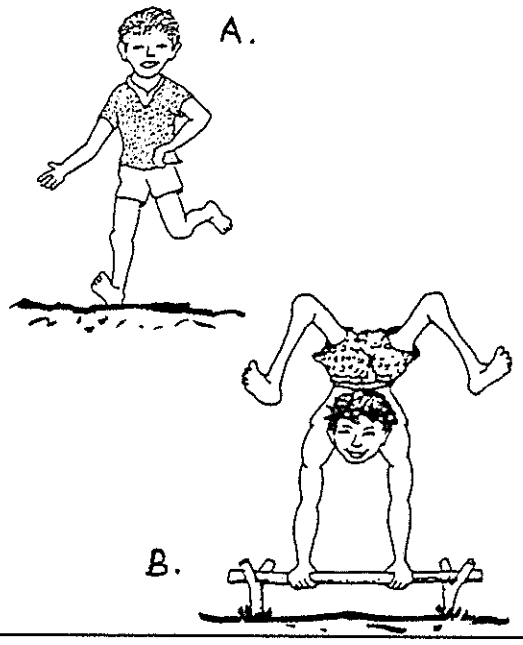
_____

_____

B. _____

_____

_____



A doctor will decide the amount of weight bearing.

A correct amount of weight bearing may help a bone grow.

An incorrect amount of weight bearing (too much) may damage the fracture or cause the bone to break again.

The amount of weight bearing is decided by knowing how strong the bone is (how much the bone has consolidated).

Question:

What are two ways that a doctor can identify how strong a bone is?

_____

_____

Common words about how much weight a limb can hold are:

a) NO WEIGHT BEARING (NWB)

b) PARTIAL WEIGHT BEARING (PWB)

c) HALF WEIGHT BEARING (HWB)

d) FULL WEIGHT BEARING (FWB) or TOTAL WEIGHT BEARING (TWB)

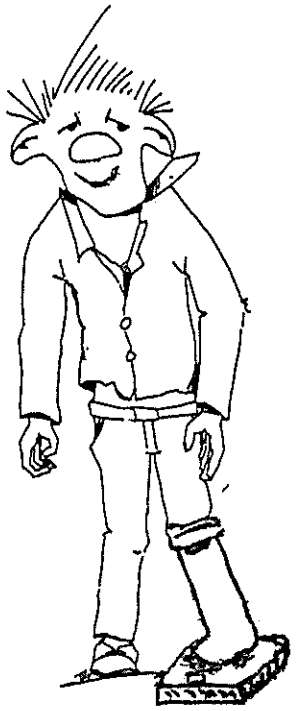
a) NO WEIGHT BEARING (NWB)

The patient must put no weight on the fractured limb.

Left leg no weight bearing

b) PARTIAL WEIGHT BEARING (PWB)

The patient may put some weight on the fractured limb.



The amount of weight will be:

* a number of kilograms
  (Example: 2kg WB on the limb)

A scale is useful to have the patient practice putting a specific amount of weight on the limb.

* a percent of the patient's body weight
  (Example: 20% of patient's body weight).

c) HALF WEIGHT BEARING (HWB)

The fractured limb can hold half the patient's body weight.

d) FULL WEIGHT BEARING (FWB) or TOTAL WEIGHT BEARING (TWB)

The patient can put all of the body weight on the limb.

IN SUMMARY

Reduction is made to put the bones in a good position.

Immobilization is made to keep the bones in a good position.

Fractures are immobilized so the bones can grow together well. If there was movement, the bones could rebreak very often.

Weight bearing may help a bone to become strong, but too much weight bearing could rebreak a bone.

E. PHYSICAL THERAPY EVALUATION OF PATIENTS WITH A FRACTURE

The PTA should carefully evaluate the following:

* location of the fracture (what bone, what side of the body)

* immobilization used (type, specific location)

  . splint:
  - fits well on the limb
  - bandaging not too tight

  . plaster (POP)
  - limb in good functional position
  - plaster equally hard in all places
  - not too loose
  - not too TIGHT
  - any pain from plaster

  (If the plaster is too tight, the distal part of the limb may have decreased movement and feeling, feel cold, look blue.)

  If the patient has any of these symptoms, the doctor should replace the plaster as soon as possible.

  . external fixator
  - pin area clean

  . traction
  - is the system pulling the bone in the right direction (same line as proximal part of the bone)
  - pin area clean

* pain (when, where, how much)

* swelling (where, how much)

* range of motion (does pain or immobilization limit ROM, where)

* function of the patient

* weight bearing status (for lower limb fractures)

* does the patient need devices (sling or walking aid)

* other problems (infection)

* <u>general</u> strength of patient (no muscle testing of muscles near the fracture)

F. PHYSICAL THERAPY TREATMENT OF PATIENTS WITH A FRACTURE

The three general groups of patients that need treatment are:

1. PATIENTS WITH A FRACTURE NOT YET CONSOLIDATED

2. PATIENTS WITH A FRACTURE THAT HAS CONSOLIDATED

3. PATIENTS WITH SPECIAL CASES OF FRACTURES

1. PATIENTS WITH A FRACTURE THAT HAS NOT YET CONSOLIDATED

If the fracture has not yet consolidated, the patient should continue to have some type of immobilization.

Before the fracture consolidates (heals completely), the PTA must remember the following rules:

** NO DEEP MASSAGE OVER THE FRACTURE **

** NO ROTATION OF THE FRACTURED BONE **

** NO PUSHING OR RESISTANCE DISTAL TO THE FRACTURE **

** NO MUSCLE TESTING NEAR THE FRACTURE **

Questions:

1. Why do you not give deep massage over a bone that has not yet healed?

2. Why can you give a little resistance proximal to the fracture and no resistance distal to the fracture?

The common types of immobilization for fractures are:

i) splint

ii) plaster (POP)

iii) external fixator

iv) traction

PT treatment guidelines for each immobilization are given in the following pages.

i) splint

General PT treatment for patients with a splint are:

a. follow the doctor's instructions

b. tell the patient why he has a splint and that he must always wear the splint

c. keep the fractured area elevated to decrease swelling

d. remind the patient not to move the fractured area

e. active movement to decrease swelling

Question:

A patient would like to remove his spling when he takes a shower. Is this a good idea?

Yes _____ No _____

Explain your answer.

_____

_____

_____

ii) plaster (POP)

General PT treatments for patients with plaster are:

a. follow the doctor's instructions

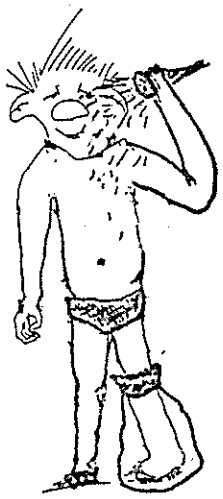
b. active movement for all joints of the body

c. isometric contractions for the muscle under the plaster.

d. active movements of the parts distal to the fracture

e. patient/family teaching about plaster - do not put it in water, it will become soft.

When bathing, the patient should put a plastic bag around the plaster.



Question:

A patient has a fracture of the left ulna. She is immobilized by a POP. She complains of pain in her wrist and decreased feeling in her fingers.

What must you do for this patient?

_____

_____

Explain your answer.

_____

_____

_____

iii) external fixator

General PT treatments for patients with an external fixator are:

a. follow the doctor's instructions

b. make sure the pin area is clean

c. active/resistive exercise for muscles except the muscles with the external fixator

d. active/active assistive exercise for the joint near the external fixator

   This is according to patient's pain!

   If the patient feels a lot of pain, stop the activity or decrease the level of activity.

e. gentle stretching of joints near external fixator to help increase ROM.

Question:

A patient has a fractured right femur with an external fixator. He has a very stiff knee and very weak knee extensor muscles.

Explain how Physical Therapy can help this patient.

_____

_____

_____

_____

iv) traction

General PT treatments for patients with traction are:

a. follow the doctor's instructions

b. breathing exercises to prevent respiratory problems.

c. prevent bedsores (patients can make small lifts to decrease pressure on posterior body parts.

d. these exercises do not move the part in traction

3. isometric co-contraction for the part in traction

(Co-contraction means to contract muscles on all sides of the joint at the same time.)

Questions:

A patient is in traction for a fracture of the right femur.

1. What muscles will you exercise isometrically?

_____

_____

2. What parts(s) of the body should not move?

_____

_____

3. Describe how the patient can prevent pressure sores on the back and butt.

_____

_____

_____

2. PATIENTS WITH A FRACTURE THAT HAS CONSOLIDATED

After the fracture has consolidated, the immobilization is removed.

General PT treatments for patients with immobilization removed are:

a. follow the doctor's instructions

b. in the beginning, active movements are used to increase ROM.

   Active movements help the patient to feel less afraid because the patient controls the movement.

   After 1-2 weeks, passive movements can be used to increase ROM. Most often, STRETCHING techniques will be needed to regain normal ROM after immobilization.

c. active assistive/active exercise of the part where immobilization has been removed.

Questions:

A man has fractured his tibia. He was immobilized in a POP for three months. The POP was from above the knee to below the ankle. His POP was removed two days ago.

1. List the movements that may be limited.

_____

_____

_____

2. Please decribe how you will begin to increase ROM at these joints.

_____

_____

_____

3. PATIENTS WITH SPECIAL CASES OF FRACTURES

Some bones of the trunk may receive treatment that is a little different than the bones of the limbs.

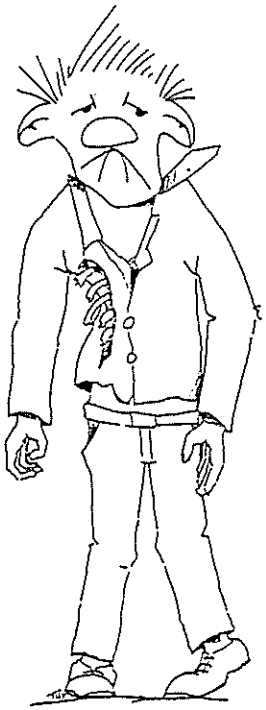
Bones that are special cases are the:

a) ribs

b) clavicle

c) fibula

d) vertebral column

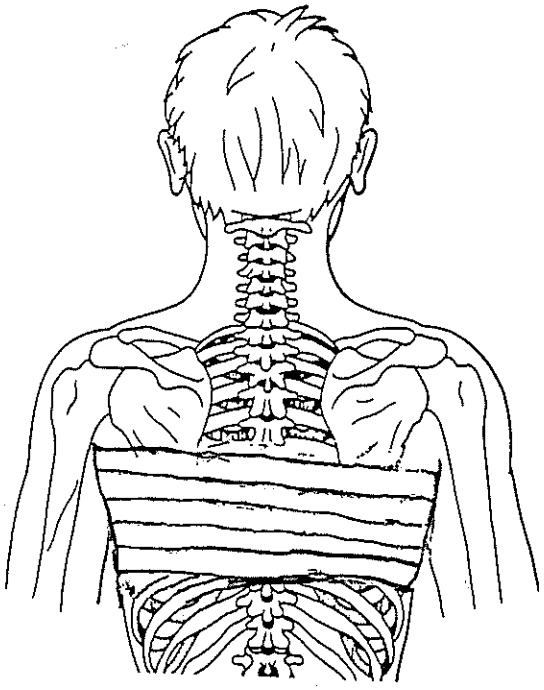


a) ribs

Generally, treatment for a rib fracture may be to bandage the chest to decrease pain.

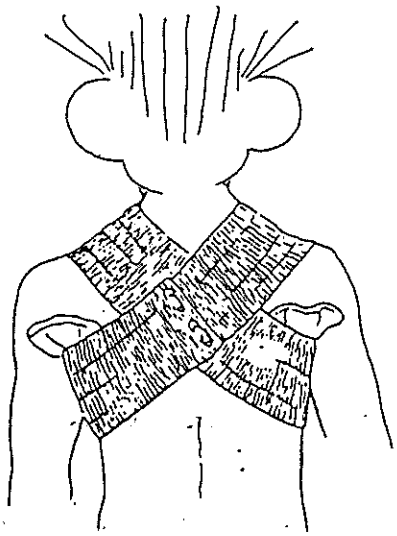
The patient should do deep breathing every day to prevent respiratory problems and keep the ribs mobile.

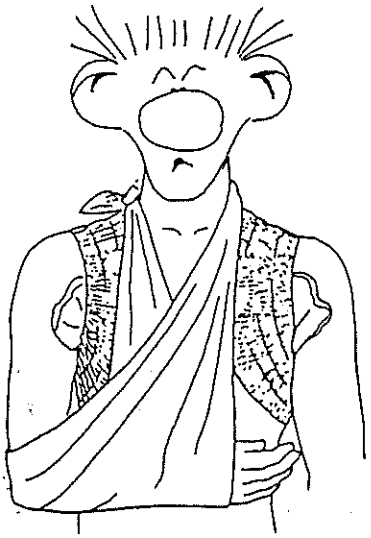
If a fractured rib has injured a lung then medical treatment is needed.



b) clavicle

If the clavicle is fractured, the arm of the same side should be put in an arm sling and rest for one month. (See BANDAGING chapter, Volume 2)





The PTA may need to slowly increase strength and ROM of the shoulder after one month.

c) fibula

If the fibula has been fractured the patient may have a POP or the patient may have no treatment and full weight bearing.

Question:

Why can the patient have total weight bearing after a fractured fibula?

_____

_____

_____

_____

d) vertebral column

If the vertebral column has been fractured, the patient should not be in sitting or standing positions without immobilization.

Sitting and standing positions will increase the weight on the vertebral body and may make the fracture worse.

The patient may have plaster or a special brace around the trunk to help hold some body weight and keep the vertebrae in a good position.

Generally, positions of trunk extension are best for patients with verebral body fractures.

Physical Therapy treatments for vertebral body fractures are:

a. follow the doctor's instructions

b. strengthening exercises of the limbs if appropriate

c. breathing exercises to prevent respiratory problems.

Questions:

1. Why are trunk flexion exercises NOT recommended for patients with fractures of the vertebral body?

2. A patient has a compression fracture of the vertebral bodies L3, L4 and L5. Describe in your own words the location and type of fracture.

3. A fractured vertebrae may put pressure on the spinal cord. Is this a problem?

   Yes _____ No _____

   Why or why not?

G. CHAPTER SUMMARY

A fracture is a broken bone.

A simple (closed) fracture means the bone remains inside the skin.

A compound (open) fracture means the skin has been broken in such a way that the broken bone and the outside air can meet.

A fracture heals by the inner periosteum making new bone that forms a callus. Little by little this callus becomes more hard. Consolidation is when the bone has completely healed.

General consolidation times are given for different body areas.

Complications that can happen with fractures are damage to other body parts and infection.

Pseudarthrosis is a bone that doesn't heal.

Reduction means to put the fractured bone in a good position.

Immobilization is the way to keep the broken bone in a good position. Immobilization prevents movement.

If joints are immobilized they should be in functional positions.

Functional positions are important because the limb is useful even if there is stiffness in the joints. Specific functional positions are given in the chapter.

Immobilization helps the bones grow together because it prevents movement around the fractured bone. Immobilization can also cause joint stiffeness and muscle weakness.

Physical Therapy evaluation and treatment guidelines were given for patients with different immobilization devices and for patients with immobilization removed.

Before a fracture consolidates the PTA must follow these rules:

- NO DEEP massage over the fracture
- No rotation of the fractured bone
- No pushing or resistance distal to the fracture (no muscle testing near the fracture)

Treatment guidelines were given for special fractured areas:

- clavicle
- ribs
- vertebral bodies

25.

AMPUTATIONS

An AMPUTATION is a loss of one part of the body.

OBJECTIVES

At the time of the exam and with 80% proficiency, the student will be able to correctly:

1. identify good patient positioning to decrease joint stiffness in AK and BK amputees.
2. describe appropriate Physical Therapy treatments for different stages of recovery for an amputee.
3. demonstrate appropriate bandaging techniques for AK and BK amputees.
4. demonstrate appropriate massage techniques for AK and BK amputees.
5. demonstrate the process of gait training for AK and BK amputees.
6. identify gait problems and describe solutions to decrease these problems.

CHAPTER CONTENTS

A. WHAT IS AN AMPUTATION?

An amputation is a loss of one part of the body.

The person who has lost a part of the body is often described as an amputee.

B. CAUSE OF AMPUTATIONS

Causes of amputations can be from:

1. trauma (mine injury, shelling, car accident)

2. disease (cancer, infection, diabetes)

3. congenital (a child born with limbs missing)

C. SPECIFIC INFORMATION ABOUT AMPUTATIONS

Because amputations are common, the PTA will be given much information to better understand this type of patient.

Information given in this section includes:

1. LOCATIONS (TYPES) OF AMPUTATIONS
2. HANDICAP INTERNATIONAL PROSTHESES, SOCKET SHAPE AND WEIGHT BEARING
3. TEMPORARY PROSTHESIS
4. SURGICAL PROCEDURES AND HANDICAP INTERNATIONAL GUIDELINES
5. COMPLICATIONS OF AMPUTATIONS.
6. PHANTOM PAIN
7. PERIODS OF RECOVERY FOR AMPUTEES

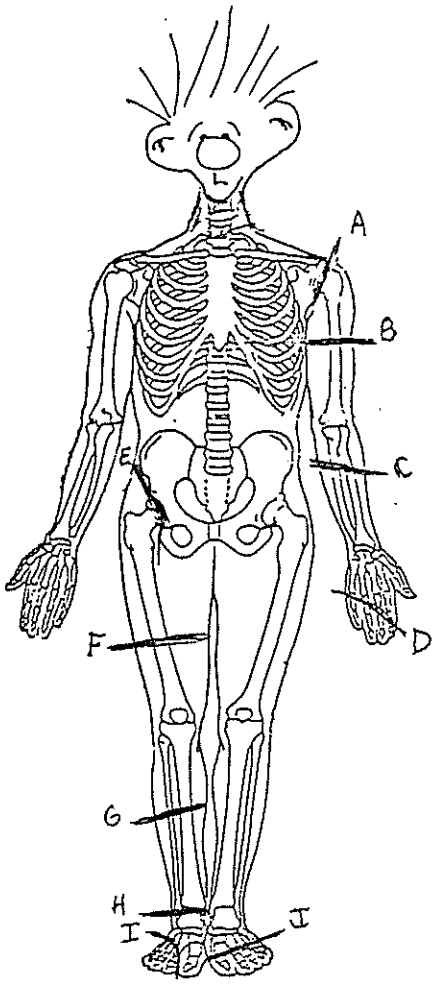
1. LOCATIONS (TYPES) OF AMPUTATIONS

Any part of the upper or lower limbs may be lost from the body.

Types of amputations = naming where the limb was cut and removed.

Activity:

Look at the picture and name the types of amputations that are given. Some answers have been provided



___ Above Knee Amputation (AKA)

___ Shoulder Disarticulation

___ Below Elbow Amputation

I Partial Foot Amputation

___ Above Elbow Amputation

___ Below Knee Amputation (BKA)

___ Partial Hand Amputation

___ Ankle Disarticulation

___ Forefoot Amputation

E Hip Disarticulation

Questions:

1. Will there be a problem with the patella in a BK amputation?

   Yes _____ No _____

   Why or why not? _____

2. A person has an amputation of part of the upper limb. The arm and the proximal forearm remain. What bones have been cut in this amputation?

3. The femur has been cut. Only the proximal part of the femur remains. All other parts of the lower limb have been lost. What type of amputation is this?

AK and BK amputations are the most common and the most important for the PTA to remember.

Activity:	
A. Please draw a picture of a left AK amputee.	B. Please draw a picture of a right BK amputee.

B. HANDICAP INTERNATIONAL PROSTHESES, SOCKET SHAPE AND WEIGHT BEARING

A prosthesis is a device that replaces the missing body part.

Questions:

1. In an AK amputee, what two main joints are missing?

_____

_____

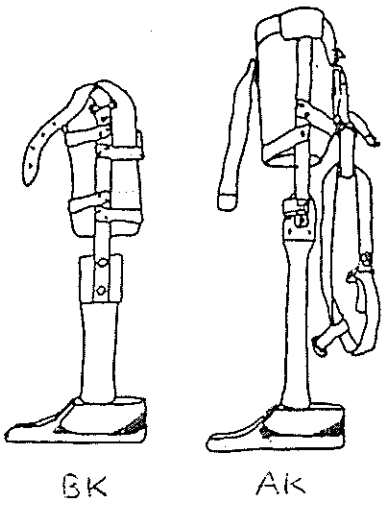
2. A BK amputee has a prosthesis. What two main body parts does this prosthesis replace?

_____

HANDICAP INTERNATIONAL is an organization that specializes in making AK and BK prostheses.

They make these protheses out of local materials.

The final prosthesis is made made out of leather, metal, wood, and rubber.



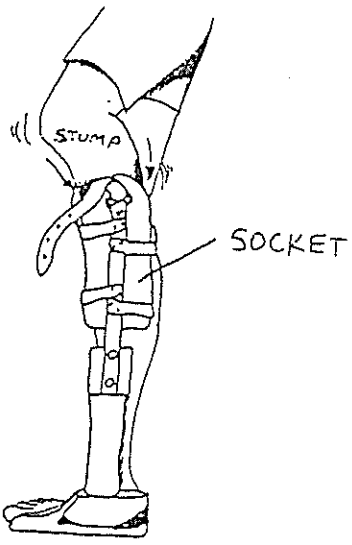
The PTA needs to understand basic vocabulary used in working with prostheses and amputees. These basic vocabulary words are:

The remaining part of the limb is called the STUMP.

Normally, the stump fits inside the prosthesis.

This is how the prosthesis is attached to the body.

The part of the prosthesis that holds the stump is called the SOCKET.



IN SUMMARY

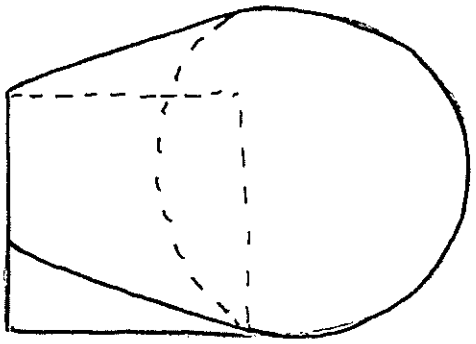
A stump is the part that remains after an amputation.

A prosthesis replaces the lost part of the limb.

A socket is the part of the prosthesis that fits over the stump.

In this section, we will present the general SHAPE and WEIGHT BEARING AREAS (in Handicap International prostheses) for AK and BK SOCKETS.

AK SOCKET



The superior view of an AK socket is shaped like a square and circle joined together.

The shape is like this to prevent the socket from turning on the stump.

Question:

Describe why the shape of the socket (above) is better than a round socket.

_____

_____

_____

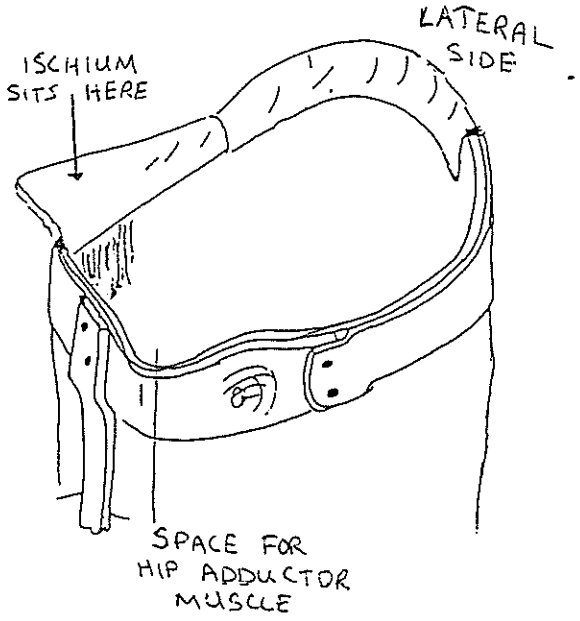
On the anterior/internal cornder there is a space for the tendon of the hip adductor muscle.

When the muscle contracts, the tendon has space to move.

On the posterior side of the AK socket, there is a "table".

The patient's ischium will sit on this table.

When the amputee stands, his weight is on the ischium. (On the posterior table of the socket).



(LEFT AK SOCKET ANTERIOR VIEW)

WEIGHT BEARING IS NOT ON THE DISTAL END OF THE STUMP !

Questions:

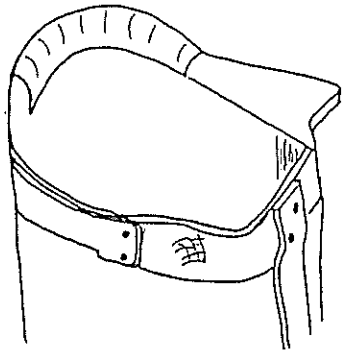
1. The patient has an AK prosthesis without a foot. The patient does not know what part of the socket is anterior and what part is posterior. Describe how you know the difference.

_____

_____

_____

2. What type of AK amputee can wear the socket in the picture, right or left?



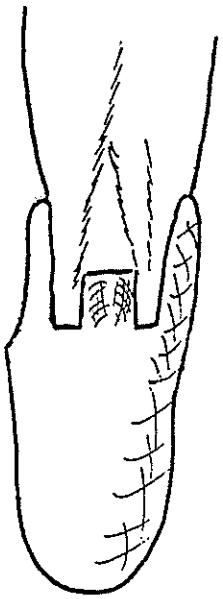
_____

Give two reasons for your answer.

_____

_____

BK SOCKET



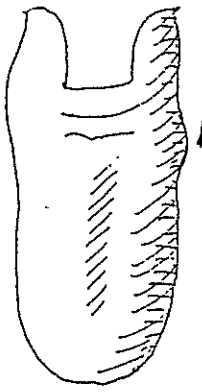
The BK socket is shaped like a triangle.

On the posterior side, there is a space for the tendons of the knee flexor muscle (hamstrings).

When the knee flexor muscle contracts, the tendons have space to move.

On the anterior/external side there is a space for the proximal part of the fibula.

This space decreases pressure on nerves that pass this area.



The anterior part of the socket fits closely to the tibia and pushes inward on the patellar tendon.

Weight bearing in a BK prosthesis is on the internal side of the tibia.

WEIGHT BEARING IS <u>NOT</u> ON THE DISTAL END OF THE STUMP !

Questions:

1. Why do you NOT want the distal part of the stump to hold the patient's weight?

_____

_____

_____

2. In anatomical position, what bone is on the external side of the leg, the tibia or the fibula?

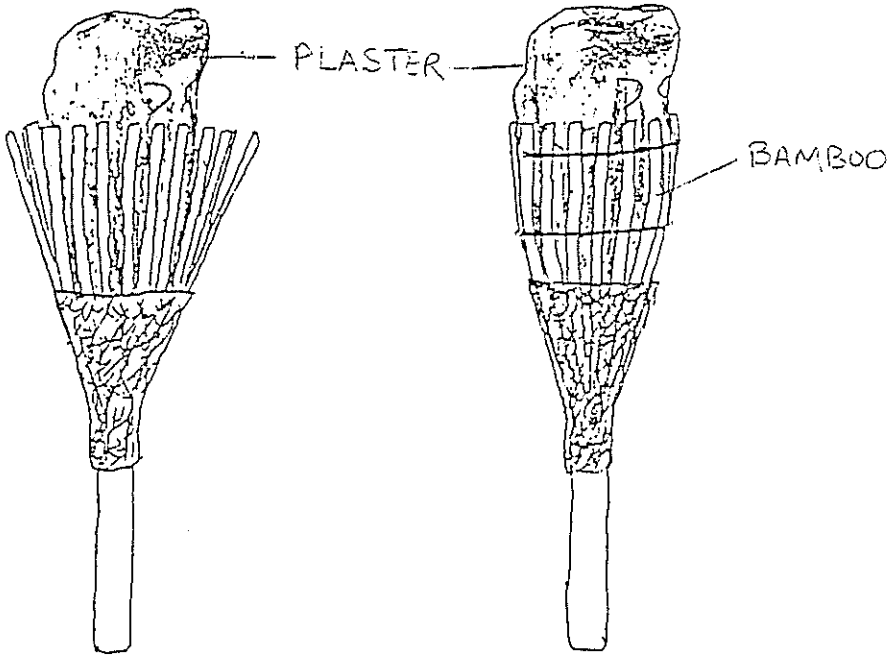
_____

3. TEMPORARY PROSTHESIS

In some countries, Handicap International makes temporary prosthesis.

A temporary prosthesis has a socket made out of plaster.

This socket is attached to the pylon by a bamboo bakest.



The socket will have the same shape as a normal AK or BK socket.

There are five main reasons for giving a patient a temporary prosthesis.

1. It is very fast and easy to make so that when the patient has good stump condition, he can begin gait training as soon as possible.

2. The size of the socket can be exchanged easily so that when swelling decreases or the stump shape changes, the socket can be changed quickly so training can continue.

3. The patient can begin gait training early which will help make walking easier when the patient receives the definitive prosthesis.

4. The patient psychologically feels better to begin walking when the stump is in good condition instead of having to wait a longer time for the definitive prosthesis.

5. Using the stump in a functional way will help to form a more normal shape more quickly.

4. SURGICAL PROCEDURES AND HANDICAP INTERNATIONAL GUIDELINES

The quality of the stump is very important to help keep the prosthesis attached to the body.

From experience, HANDICAP INTERNATIONAL has developed general guidelines for surgeons so that the stump can be as useful as possible.

These guidelines include suggestions for:

a. length of stump

b. coverage of the remaining bone

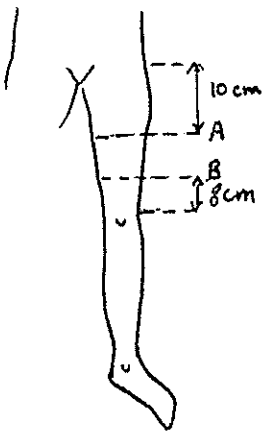
c. specific BKA information

a. length of stump

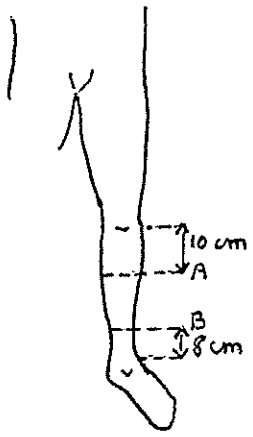
A = The shortest functional stump is 10 cm. (If the stump is too short, the patient cannot control the prosthesis well)

B = The longest functional stump is 8cm above the missing joint. (If the stump is too long, there is no space to attach the socket to the other part of the prosthesis)

C = Between "A" and "B" all amputations are possible; a longer stump is better for increased strength and control.



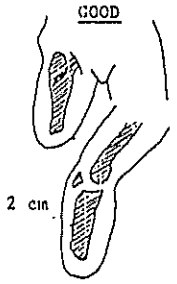
ABOVE KNEE AMPUTATION



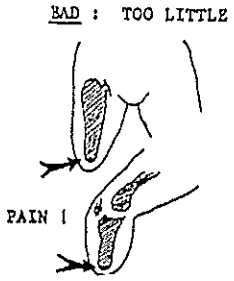
BELOW KNEE AMPUTATION

b. <u>coverage of the remaining bone</u>

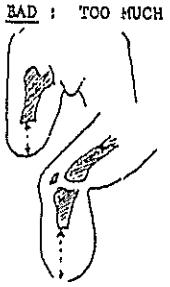
About 2 cm of muscle between the skin and the end of the bone is the best.



If there is not enough muscle covering the end of the bone, the patient will feel pain when any pressure is put on this area.



Too much muscle covering the end of the bone is useless and causes a problem in the prosthesis.

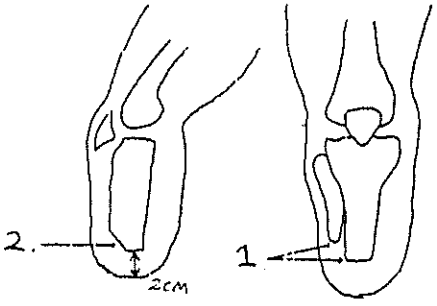


c. <u>specific BKA information</u>

There are two very important rules in cutting the bones of the leg:

1. The FIBULA must be shorter (2 cm) than the tibia.

2. The anterior part of the TIBIA should be removed and the remaining part rounded.



Both of these procedures will help to decrease the pain and complications of the BK amputee.

5. COMPLICATIONS OF AMPUTATIONS

There are many problems that could happen after an amputation.

The most common problems are:

a. infection

b. exostosis

c. neuroma

d. contracture

a. infection

Like any wound, the place of a new amputation is an open door for bacteria.

* An infection may cause skin death in that area.

  The amputee may need to have more surgery to remove the dead and infected areas.

* An infection means more time for the wound to heal.

* An infection is painful.

The amputee must try very hard to keep the stump clean.

AN INFECTION IS A BIG PROBLEM FOR AMPUTEES AND SHOULD BE PREVENTED!

b. <u>exostosis</u>

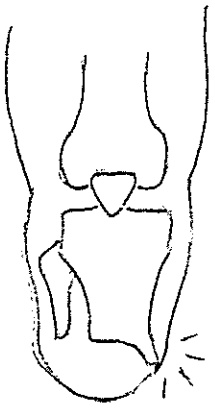
Exotosis is the continued growth of bone after it is cut.

You can see this bone growth on an x-ray.

If it grows very much, it will be painful for the amputee.

The amputee will feel pain at the end of the bone.

The only treatment for exostosis is surgery to remove the unwanted bone.



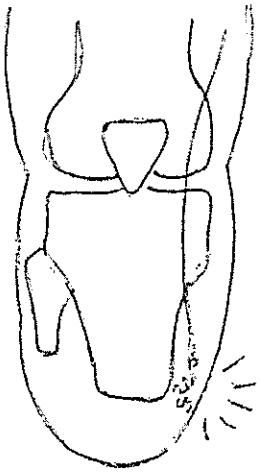
c. <u>neuroma</u>

A neuoma is a circular growth of a nerve after it is cut.

If this circular nerve is near the surface of the skin, this area will be painful when it is touched.

The patient may describe this pain as an "electric" pain going up the limb.

Again, surgery would be needed to remove a neuroma.



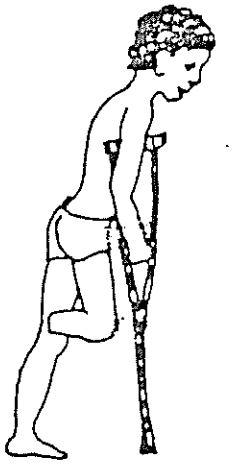
d. contracture

A contracture is tightness of a muscle that decreases joint movement.

A patient holds a joint in the same position for a long time .....

The muscle becomes tight. The joint becomes stiff. ROM is decreased.

Contractures can be prevented by daily ROM and good patient positioning.

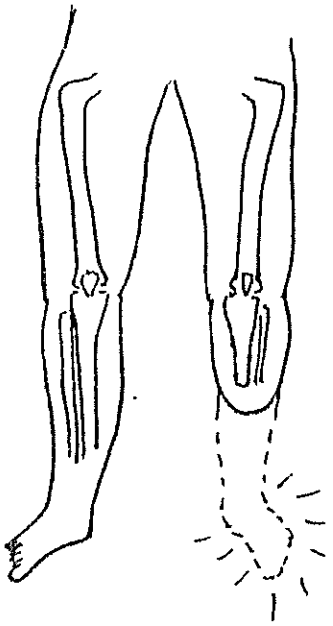


6. PHANTOM PAIN

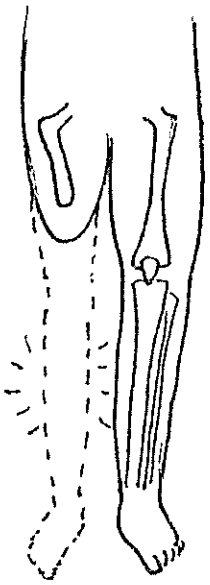
Phantom pain is pain in the part of the body that has been removed.

Examples:

A left BK amputee complains of pain in his left foot!



A right AK amputee complains of pain in his right calf!



Many patients may feel phantom pain after an amputation.

This pain may continue for 1-2 months (or longer).

To decrease phantom pain, a patient can apply pressure on the distal end of the stump.

7. PERIODS OF RECOVERY FOR AMPUTEES

There are four periods of recovery for patients with amputations:

a. nursing period

b. wound healing/strengthening period

c. early prosthetic period

d. advanced prosthetic period.

a. nursing period

The first 2-3 days after surgery, the patient may be very weak, painful and want to sleep.

b. wound healing/strengthening period

After 2-3 days, the patient should be more and more active in taking care of the wound and making the stump stronger.

c. early prosthetic period

After the wound has completely healed (3-4 weeks), the patient receives a prosthesis and is trained about how to put it on and use it in simple walking activities.

d. advanced prosthetic period

The patient demonstrates good and safe walking without assistance. He is able to go over obstacles,to and from the floor, up and down stairs, and other functional activities.

D. MEDICAL TREATMENT FOR AMPUTATIONS

Amputation surgery cuts the skin, muscles, nerves, and bones.

All of these parts must be attached together so that the stump is a good shape and size.

Medicine is given to help fight infection and decrease pain.

If a second surgery is needed to remove dead of infected skin, exostosis, or neuroma, it is called a stump revision.

GENERALLY

Medical treatment of amputees is very short.

Physical rehabilitation of amputees is very long.

E. PHYSICAL THERAPY EVALUATION OF PATIENTS WITH AMPUTATIONS

The PTA must carefully evaluate the amputee for the following:

NURSING PERIOD

* location of amputation
* other injuries or medical problems
* general condition of the patient

WOUND HEALING/STRENGTHENING PERIOD

* stump condition (swelling, infection,. scar, healing)
* pain (where, when, what kind, possible cause)
* range of motion
* strength
* balance (standing, on knees)
* functional ability (dressing, walking with crutches)
* stummp bandaging technique (pages 27 - 29)
  - figure of 8 (not circular)
  - good pressure (distal more than proximal)
  - bandage flat

EARLY PROSTHETIC PERIOD

* check patient as in wound healing period

* technique of putting on a prosthesis (page 36-37)
  - remove bandage and apply cloth
  - cloth helps pull stump into socket
  - stump pulled completely into socket

* fit of prosthesis (pages 38 - 40)

  (patient in parallel bars, standing with equal weight on both legs)
  - weight bearing (AK - ischium, BK - below patella) weight bearing is never on distal end of stump)
  - pain (where, how much, a little at ischium/patella is okay)
  - length of prosthesis (ASIS and knees same level)
  - foot flat

* walking with prosthesis (pages 41-47)
  - equal step length
  - equal time on each leg
  - good step width
  - good heel strike (both sides)
  - equal weight shifting
  - trunk straight (no lateral bending)
  - head looking forward
  - arm swing with opposite leg
  - any pain when walking? (when, where)

* any skin problem after patient has worn the prosthesis

ADVANCED PROSTHETIC PERIOD

* continue as in early prosthetic period

* check advanced activities for safety and independence

F. PHYSICAL THERAPY TREATMENTS FOR PATIENTS WITH AMPUTATIONS

Physical therapy treatment will be given for each of the following periods.

1. Nursing period
2. Wound healing/strengthening period
3. Early prosthetic period
4. Advanced prosthetic period

1. NURSING PERIOD

During the nursing period the PTA can begin the following activities.

a. breathing exercises

b. psychological support

c. good bed positioning

d. active exercises for the upper limbs and the normal lower limb

e. sitting in bed and standing as soon as possible

f. active assisted/active exercise for the stump

a. breathing exercises

After surgery it is good for a patient to do deep breathing exercises.

This helps to fill all of the alveoli and prevent secretions from collecting in the lungs.

Specific exercises and more detailed explanation can be found in RESPIRATORY chapter, Volume 2.

b. psychological support

In this early period it is good for the PTA to take time to SPEAK with the patient and family.

The PTA should explain how he and the patient will work together to heal the wound, make the stump strong, and learn to use a prosthesis to walk as normally as possible.

c. good bed positioning

Good positioning will help prevent joint stiffness and contractures.

If the patient has a contracture, a normal prosthesis cannot be used to replace the lost limb.

Activity:

A. Draw a right AK amputee with a very severe hip flexion contracture.

B. Draw a normal AK prosthesis attached to this limb.

What do you see?

_____

_____

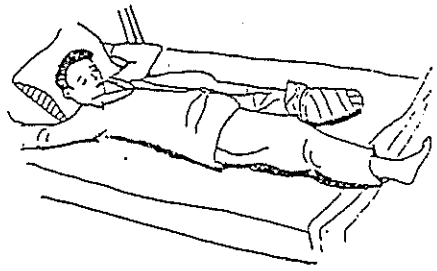
AK amputees like to rest with the hip in flexion.
BK amputees like to rest with the hip and knee in flexion.

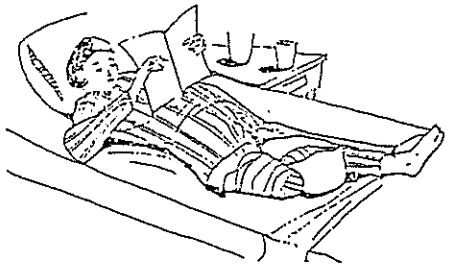
If AK and BK amputees are always in the position of hip flexion and knee flexion, they will develop tightness in these positions.

To prevent flexor tightness in the hip and knee, the patient should be encouraged to put these joints in extension as much as possible.

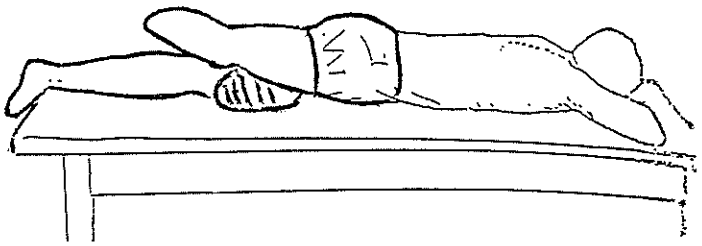
The following pictures are examples of "good positions" (extension) and "bad positions" (flexion) for patients with amputations.

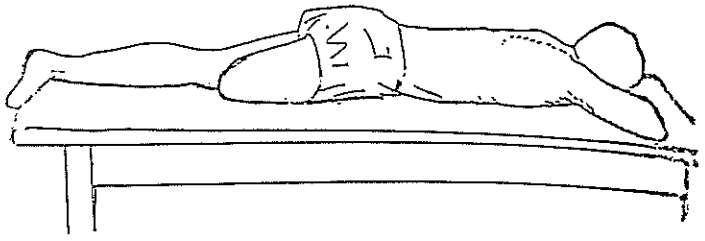
SUPINE





PRONE

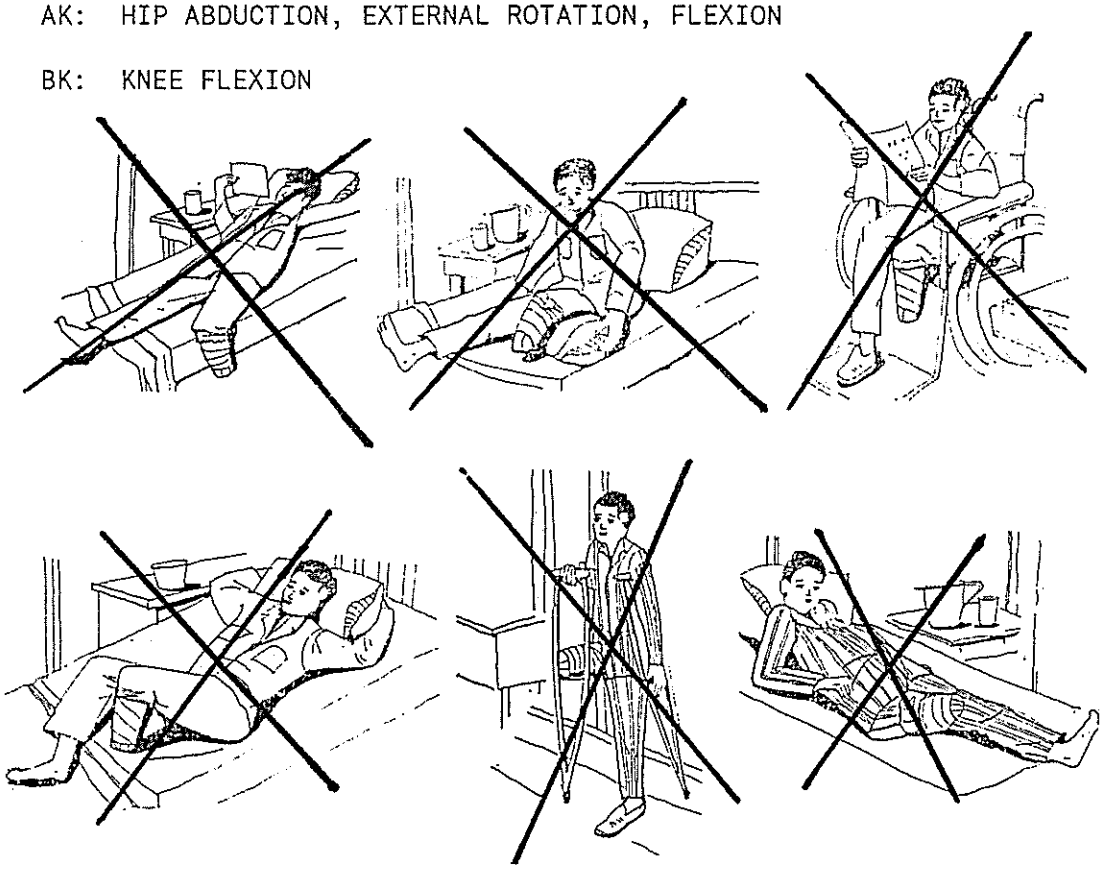




The patient must also learn to AVOID "RELAXED" POSITIONS.

AK: HIP ABDUCTION, EXTERNAL ROTATION, FLEXION

BK: KNEE FLEXION



d. <u>active exercises for the upper limbs and normal lower limb</u>

These exercises ccan help prepare the patient for standing and for general body conditioning.

e. <u>sitting in bed and standing as soon as possible</u>

As soon as the patient is able, he should be encouraged to sit in bed.

This will help prevent his body from becoming weak.

When he is ready, the patient should also begin to do some standing.

f. active assistive/active exercise for the stump

It is good for the patient to begin to move the stump early in the recovery period.

This early movement helps to increase blood to the stump and begin moving the joints to prevent stiffness.

2. WOUND HEALING/STRENGTHENING PERIOD

During the wound healing/strengthening period, the PTA can work on the following activities.

a. continue good positioning

b. teach stump bandaging techniques

c. massaging the stump

d. active exercies for the stump

e. functional activities for the patient

a. continued good positioning

Remember, to be able to move well and walk well, the amputee must have normal movement in all remaining joints.

Questions:

1. Why is prone a good lying position for an AK amputee?

_____

_____

Questions: (continued)

2. An AK amputee is laying in prone position. Will you put a pillow under the patient's hips to make him more comfortable?

Yes _____ No _____

Explain your answer.

_____

_____

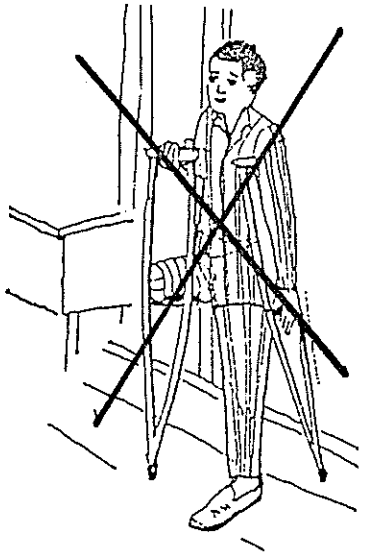
_____

We have shown that the patient should be in hip extension and knee extension positions as much as possible.

To help prevent contractures the patient should avoid "relaxed" positions.

One last rule to remember is that the patient should not rest the stump on the crutch.

This will increase the chance of hip and knee flexion contractures.



b. <u>teach stump bandaging technique</u>

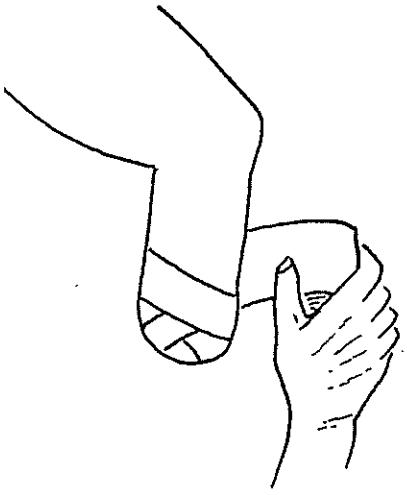
Bandaging was discussed in BANDAGING chapter, Volume 2.

Bandaging the stump happens directly after the surgeon closes the stump.

An <u>elastic bandage</u> is used to bandage the stump.

The width of the bandage used depends on the size of the stump.

The elastic gives a gentle squeezing pressure all around the stump.



There are two main reasons for bandaging the stump:

a) control/decrease swelling

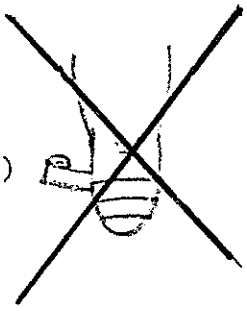
b) give the stump a good shape
(so that it can easily fit into a prosthetic socket in the future)

After 2-3 days, the PTA should teach the patient how to correctly bandage the stump by himself.

Five rules to remember when bandaging a stump.

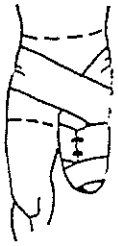
1. Always bandage in figure of 8.
(the bandage will make an X
where it crosses on the stump.)

2. Never bandage in
a circular direction.
(this may stop the blood
from going to the stump.)

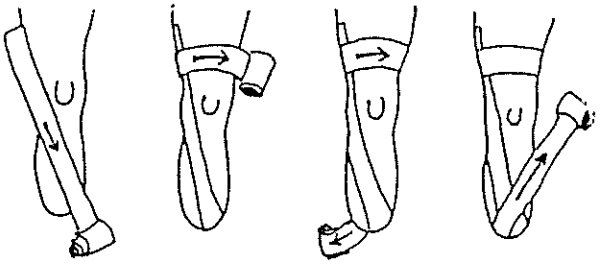


3. Distal pressure more
than proximal pressure.

4. Bandage is flat.



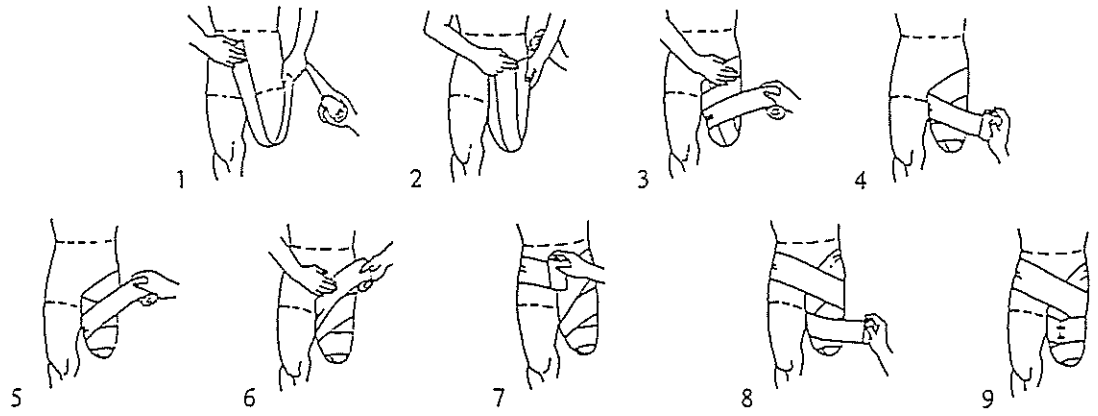
5. The distal part of
the stump should
be covered.



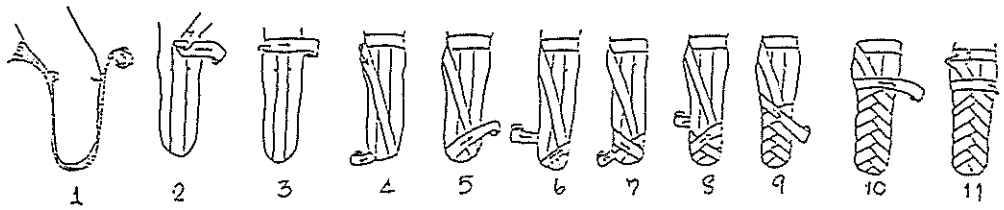
65. Good pressure / not painful.
(The bandaging should be tight
enough to keep good pressure
on the stump.)

BANDAGING PRESSURE SHOULD NOT CAUSE PAIN!

BANDAGING TECHNIQUE AK AMPUTEE



BANDAGING TECHNIQUES BK AMPUTEE



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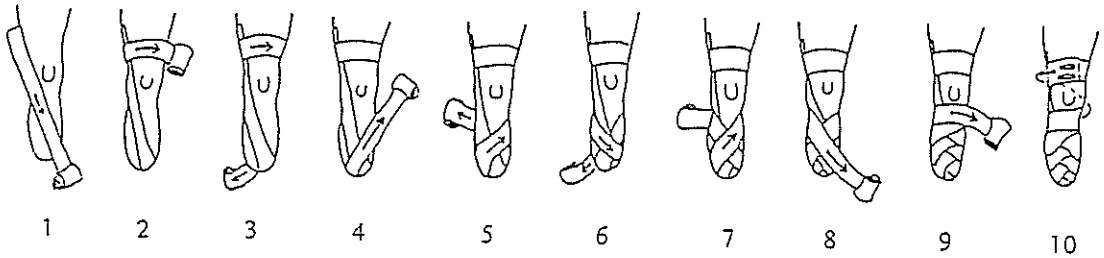
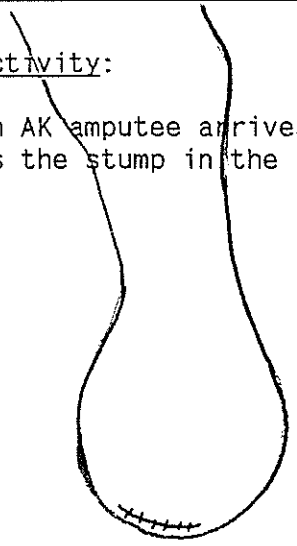




Activity:

An AK amputee arrives with a stump that has the same shape as the stump in the picture.

1. Is this a normal shape for a stump?

   Yes _____ No _____

2. Describe the type of bandaging that could have caused this stump shape.

_____

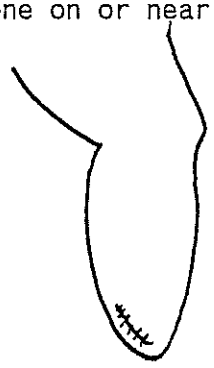
_____

_____

_____

c. massaging the stump

Most often, massage for amputees is done on or near the scar.



The scar is the place where the two pieces of skin are attached together.

A special type of string ties the two pieces together.

These ties are called sutures.

Massage for the scar area has three main functions:

1. to increase wound healing (by increasing blood circulation).
2. to prevent the scar and stump from becoming hard and immovable.
3. to decrease pain by applying a "global pressure" on the stump.

The three periods for scar healing are:

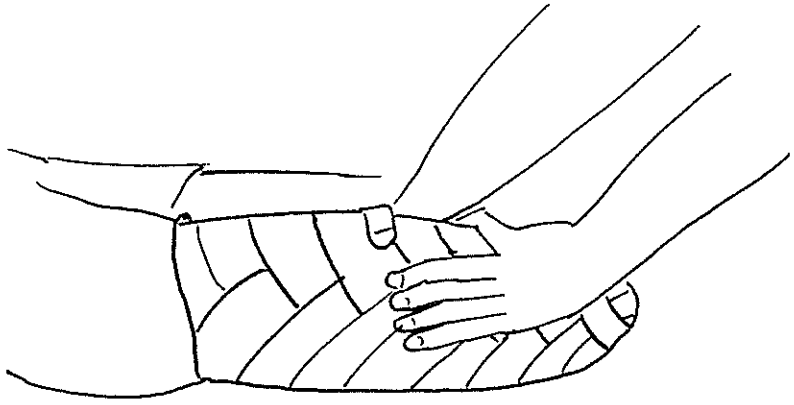
1. sutures present; scar not healed
2. sutures removed; scar not completely healed.
3. scar completely healed and closed.

1. sutures present; scar not healed / (ten days after surgery)

NO MASSAGE AT THIS TIME.

We recommend "no massage" because the stump could become infected from unclean hands, or the sutures damaged from a hard massage.

The PTA can apply "global pressure" over dressing to decrease pain. The PTA should NOT remove dressing.



2. sutures removed; scar not completely healed

Gentle massage is given to increase wound healing.

Massage is given in the direction of pushing the two pieces of skin toward each other.

IMPORTANT!

If the scar has not healed, massage is given near the scar NOT ON THE SCAR.

If there is infection, do not give massage.

3. scar completely healed and closed (one month after surgery)

Massage is given to prevent the scar
from becoming short, tight, or stiff.

Massage can be given on top of the scar
and in many directions.

If there is infection,
do not give massage.

Massage can stop when the stump and scar are soft.

Massage is very important to do the following things:

- help the scar heal
- prevent the scar from being stiff or tight
- prepare the stump to wear a prosthesis

d. active exercise for the stump

Active exercises can progress to resistive exercises as the patient becomes stronger.

Strengthening exercises help for general condition of the stump and help prepare the patient for WALKING.

Important muscles to strengthen for walking are:

For AK amputees:	HIP EXTENSORS
	HIP ABDUCTORS
For BK amputees:	KNEE Extensors

Question:

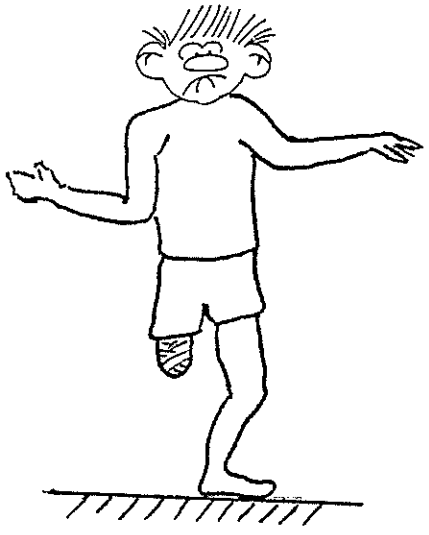
To prepare for walking, it is best to strengthen the hip ABDuctors isometrically in an ADDucted position. Why?

e. functional activities for the patient

Very early in wound healing/strengthing period, the patient should practice functional activities.

These include:

* balance exercises

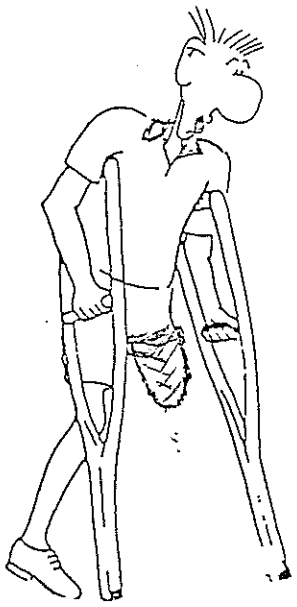


* walking with crutches

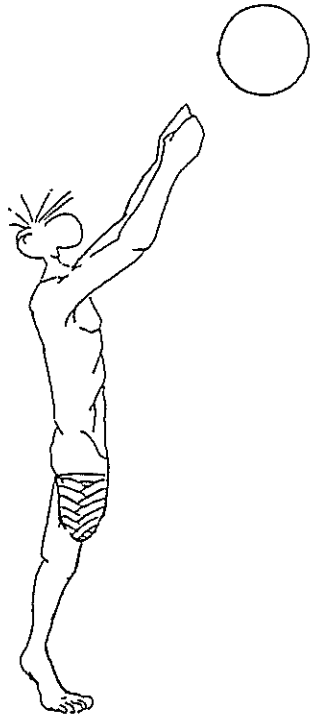
  The PTA must make sure of:

  - correct fit of crutches (see WALKING AIDS chapter, Volume 2)

  - correct gait with crutches (see WALKING AIDS chapter, Volume 2)



* Sports to improve psychology and general body condition.



3. EARLY PROSTHETIC PERIOD

Before receiving any type of prosthesis, the patient must have:

* GOOD STUMP CONDITION
  - no stump pain
  - no open wound on the stump
  - no hard areas on the stump
* COMPLETE RANGE OF MOTION
* GOOD MUSCLE STRENGTH
* GOOD BALANCE ON THE NORMAL LEG

The PTA must evaluate the patient carefully. Prosthetic period begins AFTER the above goals are achieved.

Question:

Please list five different ways the PTA and the patient have worked together to prepare for receiving a prosthesis.

_____

_____

_____

_____

_____

During the early prosthetic period, the PTA should work on the following activities.

a. continue activities as in wound healing/strenghening period

b. teach the patient how to put on prosthesis

c. make sure prosthesis has good fit

d. begin basic gait training

e. identify gait problems, possible causes and how to correct them.

a. <u>continue actitivies as in wound healing/strengthening period</u>

Active exercise for the stump, functional activities, make sure bandaging technique is good, make sure stump condition remains good.

b. <u>teach patient how to put on prosthesis</u>

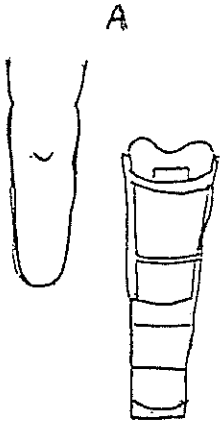
Techniques for putting on prostheses are the same for all Handicap International prostheses - temporary or definitive.

<u>PUTTING ON A PROSTHESIS</u>

A. The patient should remove the bandage before putting on the prosthesis!!

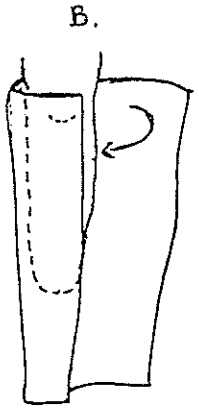
The prosthesis was measured to fit a stump without a bandage.

A bandage will change the fit of the prosthesis.



B. A cloth is put around the stump.

This cloth will help to pull the stump into the socket.

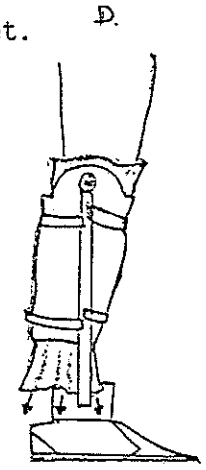


C. The cloth is twisted and pulled through the hole in the socket.

This pulls the stump into the socket.

D. The cloth is <u>untwisted</u> and all parts are pulled downward equally.

This pulls the stump into a good position in the socket.



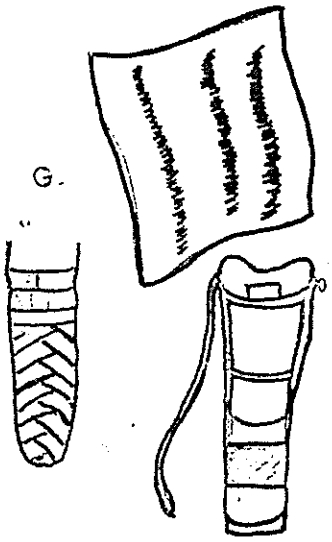
E. The cloth stays on the stump when the prosthesis is on.

The end of the cloth can be tied around the prosthesis.

F. A belt is also used to hold the prosthesis on the stump.

G. Step out of the prosthesis when you want to remove it.

Remove the cloth and rebandage the stump.



c. make sure prosthesis has a good fit

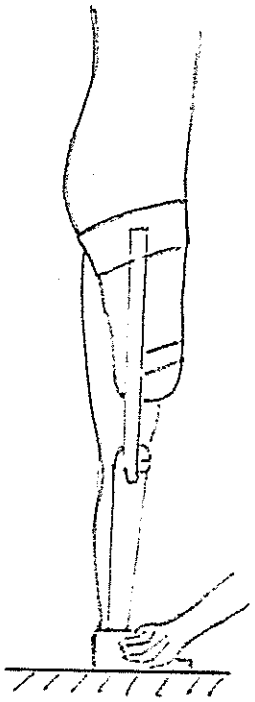
To check the fit of the prosthesis, the patient should be standing in the parallel bars with legs straight, feet equal, trunk straight, and equal weight bearing on both legs.

Ways to check for equal weight bearing are to:

1. PTA tries to move the prosthetic foot with his hand.

2. The PTA tries to put a piece of paper under the prosthetic foot.

* If there is good weight bearing, neither of these activities should be possible.



What to check

1. weight bearing
2. pain
3. belt tightness
4. length and alignment

1. Weight bearing

AK prosthesis:

- PTA should feel if the ischium is on the socket "table".

- Patient should feel pressure on the ischium.

BK prosthesis:

Patient should feel pressure
just below the patella.

2. Pain

- An AK amputee may normally feel a little pain on the ischium when first wearing the prosthesis.

- A BK amputee may normally feel a little pain just below the patella when wearing a BK prosthesis.

If the patient feels severe pain in these areas or feels pain in any other areas, the PTA must know:

. how much pain

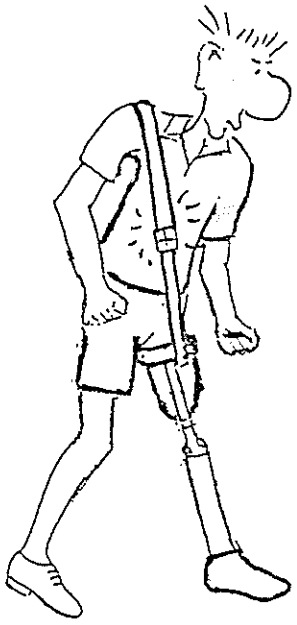
. where is this pain

. when does the patient feel the pain

The PTA must work together with the technician to identify the cause of the pain and try to decrease it.

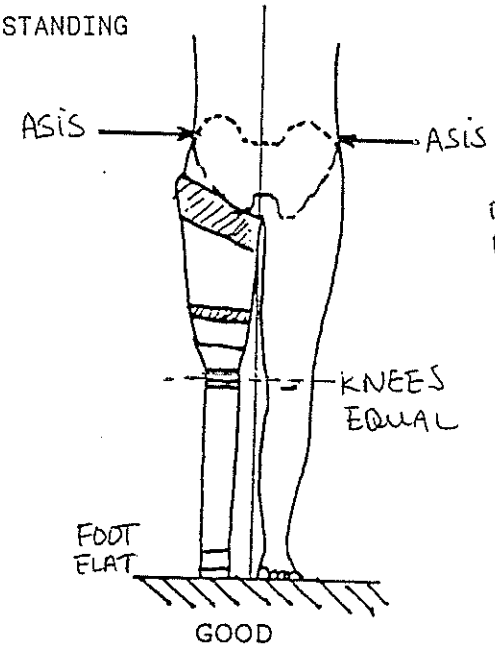
3. Belt tightness

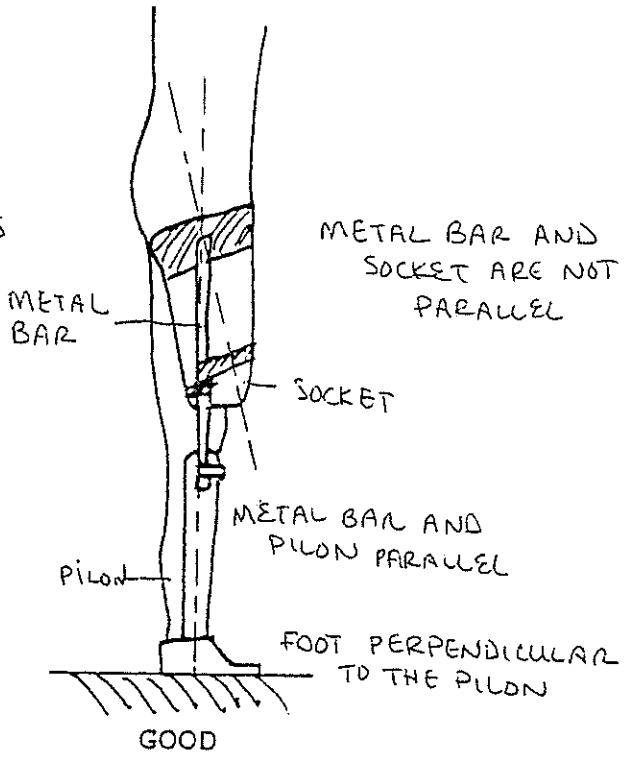
The belt in an AK prosthesis
is anterior to the hip.
If the belt is too tight,
it will limit hip extension.



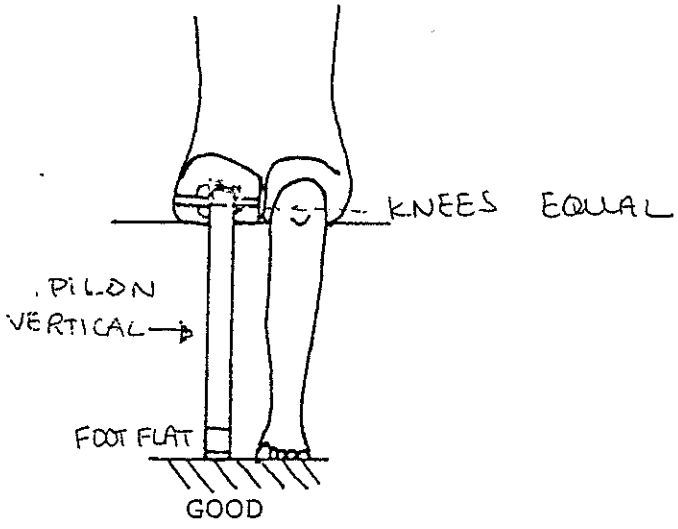
4. Length and alignment

STANDING





SITTING



d. Begin basic gait training

Before gait training the PTA must remember that wearing and using the prosthesis must begin step by step.

In the beginning, the patient should use the prosthesis for a short time only (about ten minutes, 2-4 times each day).

This time can increase as the scar and the stump become more strong.

REMEMBER !

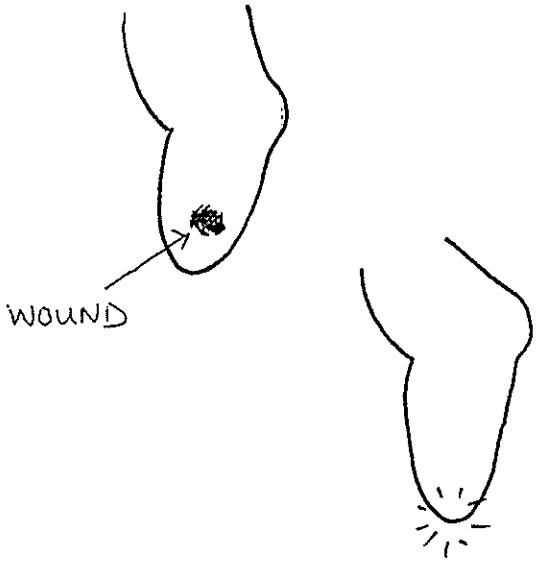
WEARING A PROSTHESIS TOO MUCH TOO SOON WILL CAUSE STUMP DAMAGE.

IF THERE IS STUMP DAMAGE, THE TRAINING MUST STOP.

After each use of the prosthesis, the PTA should carefully check the stump of the patient.

The PTA must look for red areas, painful areas, or open wounds.

If there is an open wound, the patient must stop training with the prosthesis.



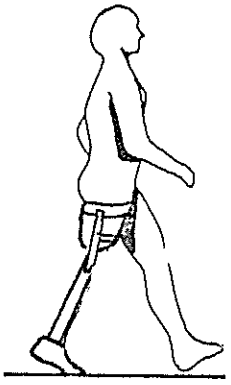
Red or painful areas should be reported to the technician so adjustments can be made.

Basic steps of beginning gait training are given in GAIT TRAINING chapter, Volume 2.

The PTA and patient must begin with the simple parts of gait training first.

Gait training activities specific for amputees are:

AK AMPUTEES



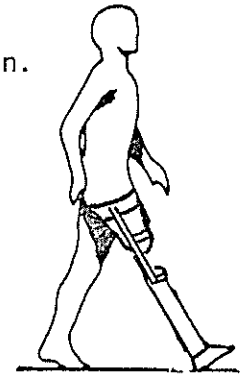
* practice hip extension in stance phase

(PTA must put one hand on patient's chest and one hand on patient's butt to keep the trunk straight and the hip in extension)

* practice no movement of the pelvis

(The hip flexes to bring the leg forward)

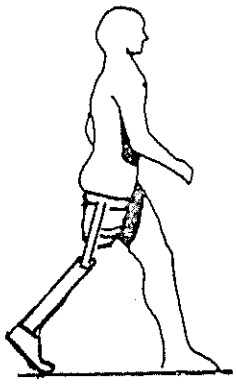
* practice good knee extension.



AK AND BK AMPUTEES

* practice good heel strike (prosthetic side)

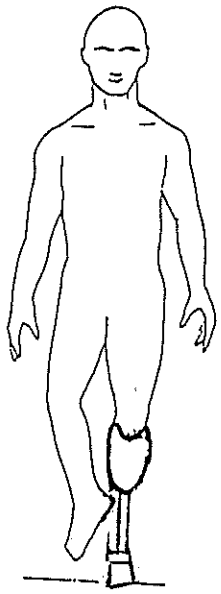
* practice good toe off (prosthetic side)



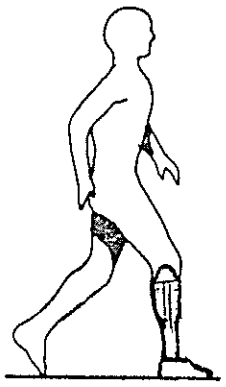
e. Gait problems, possible causes and how to correct them.

The PTA must be able to identify if a patient is walking normally.

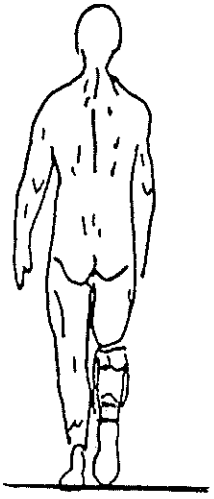
The PTA can observe the patient walk from three views:



ANTERIOR VIEW



LATERAL VIEW



POSTERIOR VIEW

If a patient does not walk normally, it can be for three reasons:

A. physical problem (muscle weakness, pain, contracture).

B. mental problem (fear).

C. structural problem of the prosthesis

The PTA can try to help physical or mental causes of gait problems.

If the problem is in the prosthesis, a technician should be consulted to help solve this gait problem.

On the following pages are common gait problems, causes, and suggestions to help solve these problems.

GAIT PROBLEM	CAUSE	SOLUTION
unequal steps and unequal timing	<u>prosthetic cause:</u> * poor knee joint (AK) * poor socket position <u>patient cause:</u> * pain * fear * poor gait training	see technician – identify cause of pain and treat – gait training in parallel bars – instruct patient
lateral bending (to prosthetic side during stance)	<u>prosthetic cause:</u> * poor alignment * prosthesis too short <u>patient cause:</u> * pain * weak hip abductors	see technician – identify cause of pain and treat – strengthen weak hip abductors
walking with the pelvis (not the hip) (AK amputees)	<u>prosthetic cause:</u> * poor socket position <u>patient cause:</u> * poor gait training * weak hip flexors	see technician – retrain patient for good walking habits
foot rotation (at heel strike)	<u>prosthetic cause:</u> * poor alignment <u>patient cause:</u> * weak stump, no control of prosthesis	see technician – general strengthening for the stump

GAIT PROBLEM	CAUSE	SOLUTION
head down during gait cycle	<u>prosthetic cause:</u> 0 <u>patient cause:</u> *fear * poor gait training	0 - practice walking with head looking forward - feedback
instability of knee	<u>prosthetic cause:</u> * poor alignment <u>patient cause:</u> * weak knee extensors	see technician - strengthen knee muscles
abducted gait	<u>prosthetic cause:</u> * prosthesis too long * poor knee joint <u>patient cause:</u> * pain * fear * poor gait training	see technician - identify cause of pain and treat - patient instruction and practice of gait
decreased weight shifting	* poor gait training	- retrain patient for good walking habits
decreased (or incorrect) arm swing	* poor gait training	- retrain patient for good walking habits
decreased heel strike on mormal leg	* poor gait training	- retrain patient for good walking habits

4. ADVANCED PROSTHETIC PERIOD

Physical Therapy treatments in advanced prosthetic period include:

a. continuing activities from early prosthetic period

b. practising more difficult walking activities

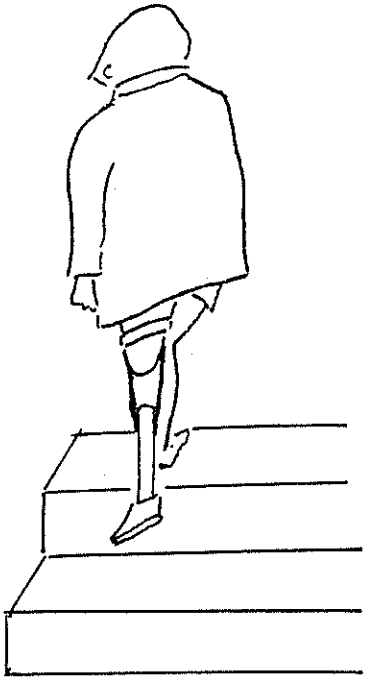
a. continuing activities from early prosthetic period

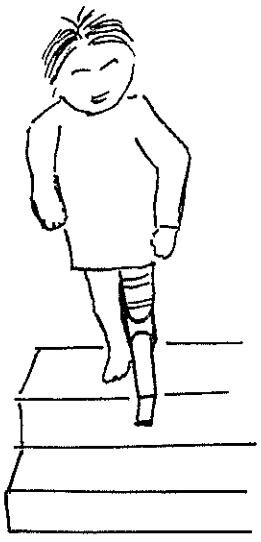
As much as possible the patient should continue activities from early prosthetic period until he has a near normal gait and is safe and independent in all activities of early prosthetic period.

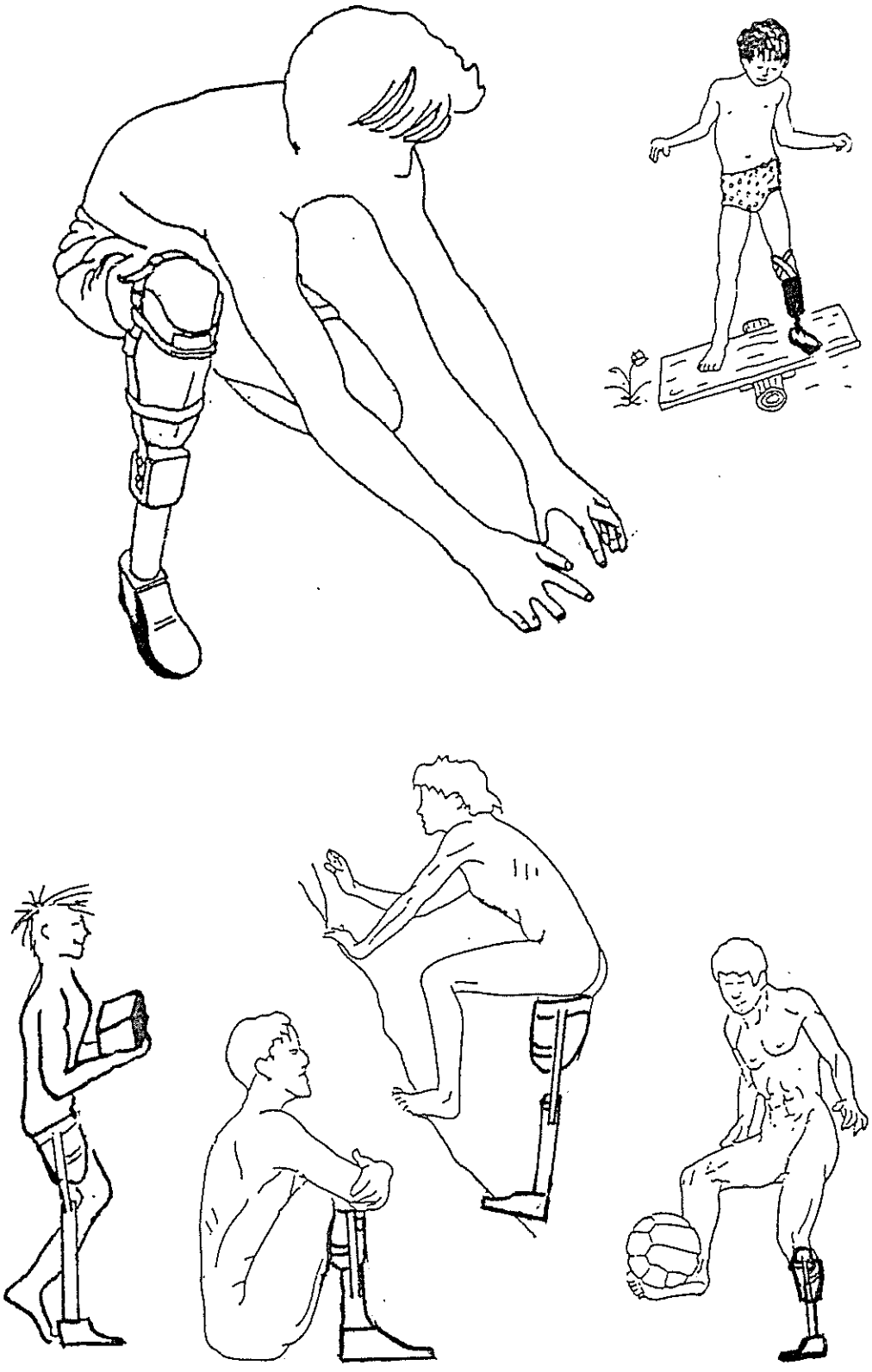
b. practising more difficult walking activities

The PTA must encourage the patient to practice the following activities while wearing the prosthesis.

* floor <----> standing
* stairs
* stepping over and under objects
* carrying heavy objects







See GAIT TRAINING chapter, Volume 2, for more advanced gait activities.

G. CHAPTER SUMMARY

An amputation is a loss of one part of the body. The remaining part of the limb is called the stump.

A prosthesis is a device that replaces the missing body part.

Surgical guidelines are given to help inform doctors about the stumps that are best suited for Handicap International prostheses.

Complications of amputations include:

- infection
- exotosis (continued bone growth after it is cut)
- neuroma (circular nerve growth after it is cut)
- contracture

Phantom Pain is pain in the part of the body that has been removed.

Periods of recovery for amputees are:

- nursing period
- wound healing/strengthening period
- early prosthetic period
- advanced prosthetic period

Physical Therapy evaluation and treatment suggetions are given for each period.

General rules for treatments:

- positioning

AVOID	Hip Flexion
	Hip Abduction
	Hip Internal Rotation
	Knee Flexion

- bandaging

  . always in figure of 8's
  . never circular
  . distal pressure more than proximal
  . bandage is flat
  . good pressure/not painful
  . end of stump is covered

massage - techniques vary according to wound

- sutures present/ scar not healed	no massage, global pressure only
- sutures removed, scar not completely healed	push skin together no massage on top of scar
- scar completely healed and closed	massage on top of scar in any direction

exercise

For walking it is important to strengthen

Hip Extensors
Hip ABDuctors
Knee Extensors

Before receiving prosthesis, the patient must have

. good stump condition (no pain, wound, hard areas)

. complete ROM

. good muscle strength

. good balance on normal leg

Prosthetic training includes:

. putting on prothesis correctly

. correct fit (weight bearing, no pain, alignment)

. balance exercises

. basic gait training

. evaluation of gait problems and corrections

. advanced gait activities

26.

CLUB FOOT

CLUB FOOT is a congenital deformity of one or both feet.

OBJECTIVES

At the time of the exam and with 80% proficiency, the student will be able to correctly:

1. describe the three main positions of a club foot deformity.
2. compare the three different types of club foot.
3. describe the four main Physical Therapy treatments that can be used to help club foot.
4. compare three types of immobilization that can be used to treat club foot.
5. demonstrate two of the four main treatments used to help club foot.
6. explain why family teaching is important for all club foot patients.

CHAPTER CONTENTS

A. WHAT IS CLUB FOOT?

Club foot is a congenital deformity of one or both feet.

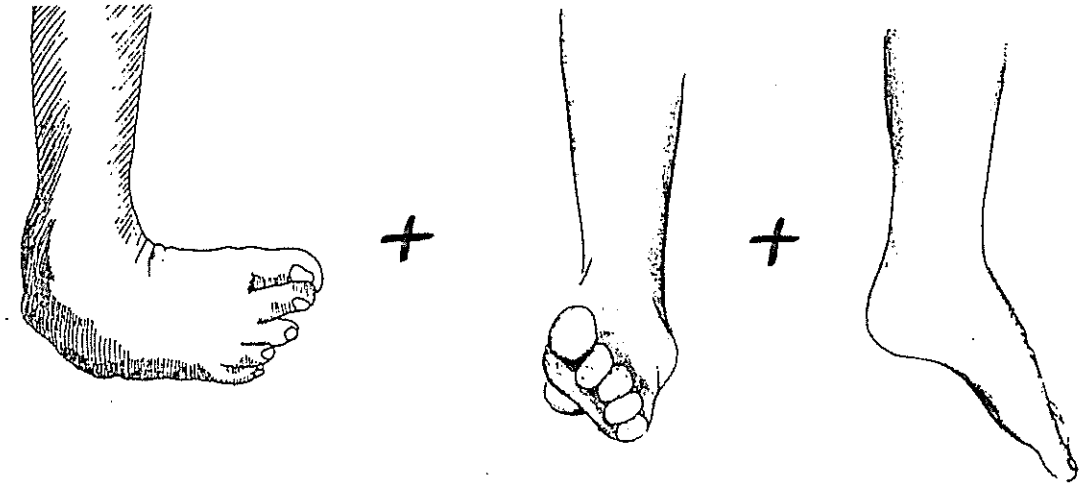
congenital = happens before birth

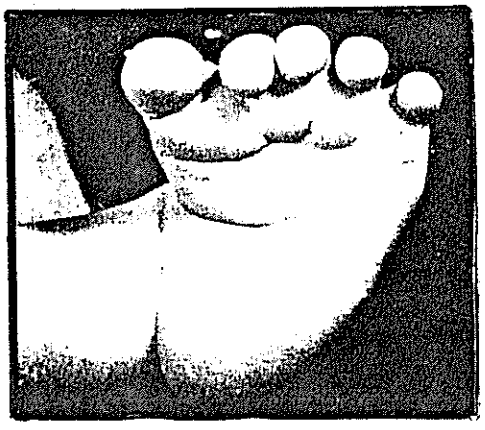
The deformity of the foot is a combination of:

a. adduction of the forefoot

b. inversion of the heel and forefoot

c. plantar flexion of thd ankle (equinus)





B. CAUSES OF CLUB FOOT

FETAL POSITION

The cause of club foot is generally unknown.

Club foot may be from how the baby is positioned inside of the mother.

Club foot may be hereditary.

C. SPECIFIC INFORMATION ABOUT CLUB FOOT

The PTA must understand club foot to treat it.

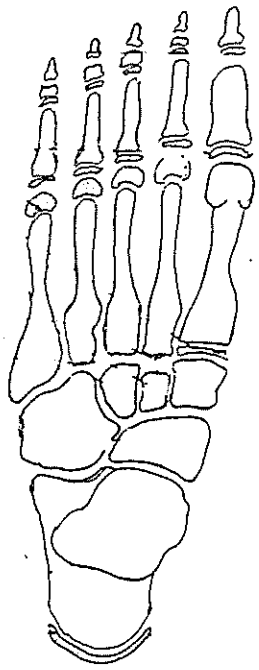
The following information will be given in this section:

1. normal bone growth in children
2. deformities of the bones in club foot
3. muscular problems found in club foot
4. types of club foot.

1. Normal bone growth in children

The bones of a baby are different than the bones of an adult.

Below are pictures comparing an adult's foot with a baby's foot.



NORMAL ADULT FOOT

NORMAL BABY FOOT

A baby's bones are softer, smaller, and have not finished growing.

Because the bones are very small and movable, CLUB FOOT CAN BE EASILY TREATED IN YOUNG INFANTS.

As the child becomes older, the bones become bigger, harder, and very difficult to move.

WARNING !

Too much pressure on a baby's bones can DAMAGE or DESTROY them.

The PTA must remember to be GENTLE when working with children.

Questions:

1. Why should club foot treatment begin as soon as possible after the baby is born?

2. A PTA believes the harder that he pushes on the baby's foot, the faster the baby will have a normal foot shape. Explain why this PTA is WRONG.

2. Deformities of the bones in club foot

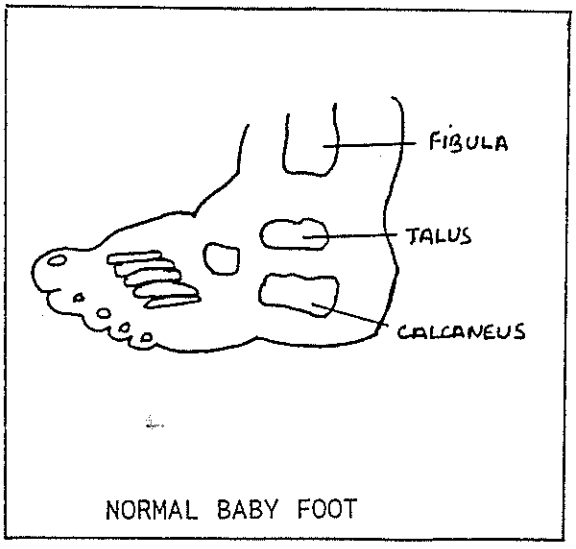
In the normal foot, the talus is inferior to the tibia and fibula and directly above the calcaneus.

In club foot, the following changes are seen

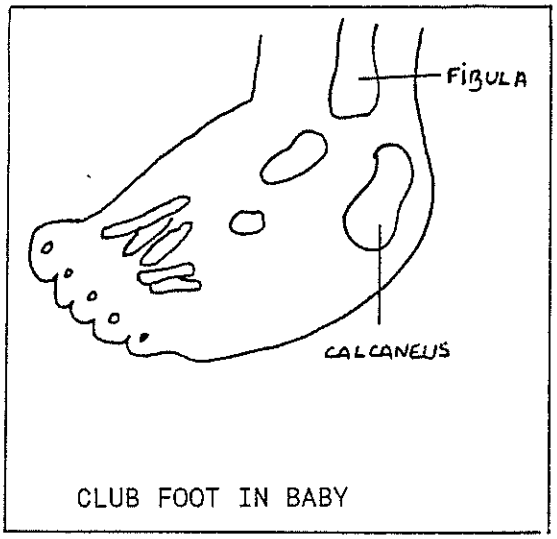
a) CALCANEUS is in plantar flexion, adduction and inversion;

b) TALUS is in plantar flexion; the talus moves anteriorly out of the space between the two malleoli.

Below are pictures comparing a normal baby's foot with a club foot.



NORMAL BABY FOOT



CLUB FOOT IN BABY

3. Muscular problems found in club foot

Questions:

1. With the foot fixed in plantar flexion, what muscle(s) will be shorter?

_____

_____

_____

_____

_____

2. The club foot is also in inversion.

   Will the foot evertors be strong or weak?

   _____

   Will the foot evertors be short or long?

   _____

The muscle problems in club foot are tightness of the ankle plantar flexors and invertors, and increased length of the evertors.

These muscle problems are from continued bad positioning of the baby's foot.

4. Types of Club Foot

The severity of the deformation determines the type of club foot.

The types of club foot can be detetermined at the time the baby is born.

The three types of club foot are:

TYPE I	EASY TO CORRECT (put foot in a normal position)
TYPE II	POSSIBLE TO CORRECT WITH DIFFICULTY or POSSIBLE TO CORRECT INCOMPLETELY
TYPE III	IMPOSSIBLE TO CORRECT (fixed)

D. MEDICAL TREATMENT OF CLUB FOOT

Generally, no medical treatment for club foot is given.

If Physical Therapy is not successful in correcting club foot, SURGERY would be needed to correct a club foot deformity.

Surgery is the LAST option. Club foot is a problem that can be treated effectively with good cooperation of the family.

Surgery does not always make a perfect foot. After surgery the patient must have continued Physical Therapy to make sure that the foot will be in a good position.

Question:

Generally, why do you not give medical treatment for club foot?

_____

_____

_____

_____

E. PHYSICAL THERAPY EVALUATION OF PATIENTS WITH CLUB FOOT

When evaluating a child for club foot, the PTA must:

* check passive ROM of the feet to determine the type of club foot (remember these are gentle movements!)

* identify what movements the child can do actively

* check if the child has any other deformities or abnormalities

* consider the age of the child and type of club foot in deciding treatment

F. PHYSICAL THERAPY TREATMENT OF PATIENTS WITH CLUB FOOT

Physical Therapy treatments are very effective in helping to correct club foot deformities.

Information presented in this section includes:

1. Basic rules for club foot treatment
2. Family teaching
3. P.T. treatment used to help correct club foot
4. Follow-up care for club foot patients

1. Basic rules for club foot treatment

REMEMBER !

* club foot treatment must be started very early
* the family must be taught how to do the treatments
* club foot treatments must be given regularly
* be gentle -- a baby's foot can be damaged easily
* the child will need P.T. treatments for a long time

2. Family teaching

In this section and in the whole chapter, we use the word "family" to mean the person that will be responsible for the care of the child.

Most often, the "family" will mean the mother of the child. We encourage the involvement of the father and older brothers and sisters to be involved in treatments so that the baby can receive support from the whole family.

Family participation in club foot treatments is very important.

The family must understand club foot and know that they can help the baby to recover.

If the family does not understand the reasons for treatment, they will not follow the PTA's suggestions, and the baby may have poor recovery.

The PTA must encourage the family to participate in the treatments and make sure that the family can make simple treatments independently.

In this way, the family can be responsible for the treatments given many times each day.

IN SUMMARY

The PTA must take time to:

* demonstrate each treatment so that the family can observe

* clearly explain why this treatment is needed (how it will help, what happens if it is not made)

* explain how often the treatment should be made

* have the family member <u>demonstrate</u> the treatment for the PTA to see that the family member understands how to do it.

<u>Questions</u>

1. The mother of a baby with club foot does not understand why you ask her to help with treating the baby. What will you say to this woman?

_____

_____

_____

_____

2. You travel to see the club foot baby in her home. When you arrive, the family leaves. The family would like to do other things at the same time you work with the baby. Is this a good idea?

Yes _____ No _____

Explain your answer.

_____

_____

_____

_____

3. P.T. treatments used to help correct all types of club foot

a. massage and family teaching

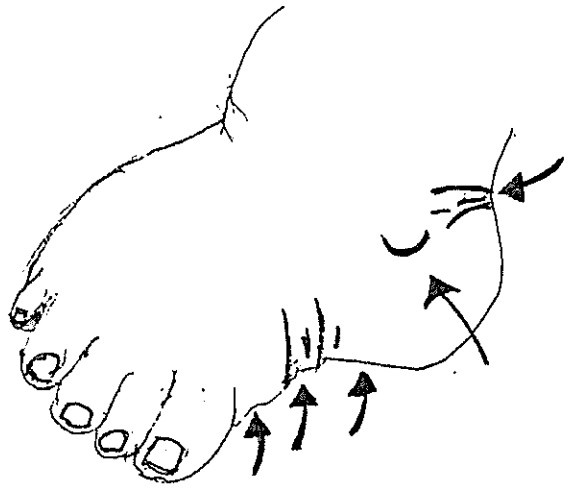
b. passively moving the foot into a good position and family teaching

c. stimulation and family teaching

d. immobilization and family teaching

a. massage and family teaching

Massage is given to the toes, foot, and lower leg. More specifically, the areas posterior and superior to the heel, internal ankle and medial side of the foot. These are areas where the skin may be tight.



Massage is given for three main reasons:

* increase trust of the baby

* apply small stretch to the muscles

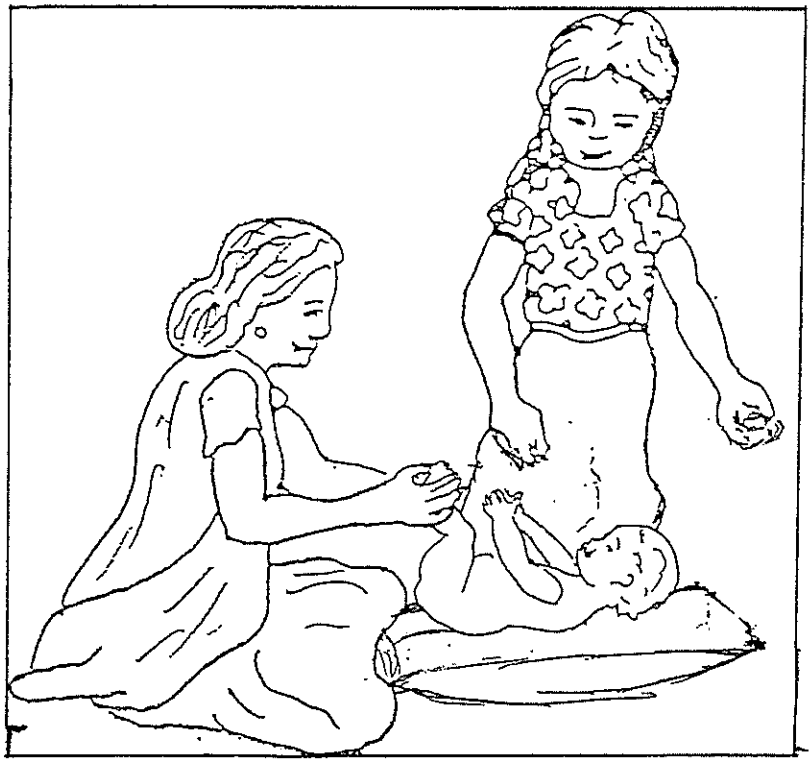
* prevent skin tightness or loosen tight skin.

Massage should be given for 10-20 minutes 2-3 times each day.

The PTA must demonstrate the technique and location of massage for the family.

The PTA must explain why massage is given to the child and how often it must be made.

The family must demonstrate the massage technique and the PTA can give positive feedback or suggestions for improvement.



b. <u>passively moving the foot into a good position and family teaching</u>

The main rule to remember is the movements of the baby's foot should be <u>gentle</u>.

A baby's bones are not strong and can be damaged easily.

WARNING!

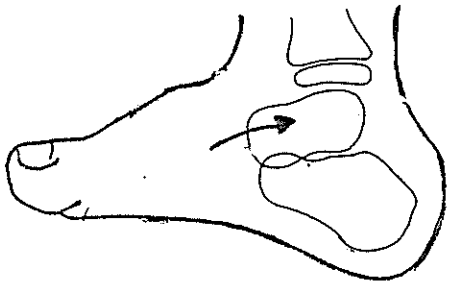
NEVER FORCE MOVEMENTS IN A BABY'S FOOT

Damage can be caused by:

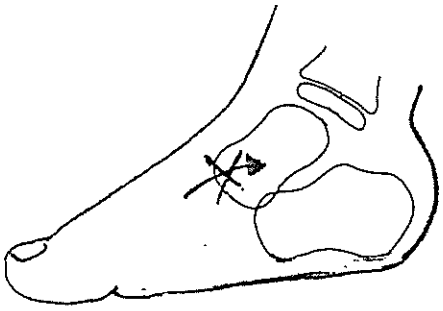
pushing too hard on the bones

two bones being forced together

NORMAL DORSIFLEXION



FORCED DORSIFLEXION



Steps to follow in moving the foot into a good position.

REMEMBER: HINDFOOT ---> FOREFOOT ---> ANKLE

Gentle DISTRACTION should be used before all movements. Distraction is a pulling movement to make space between the bones before moving them.

STEP 1: Distract calcaneus (gently pull calcaneus downward)

STEP 2: Correct inversion of the heel (gently pull the heel outward)

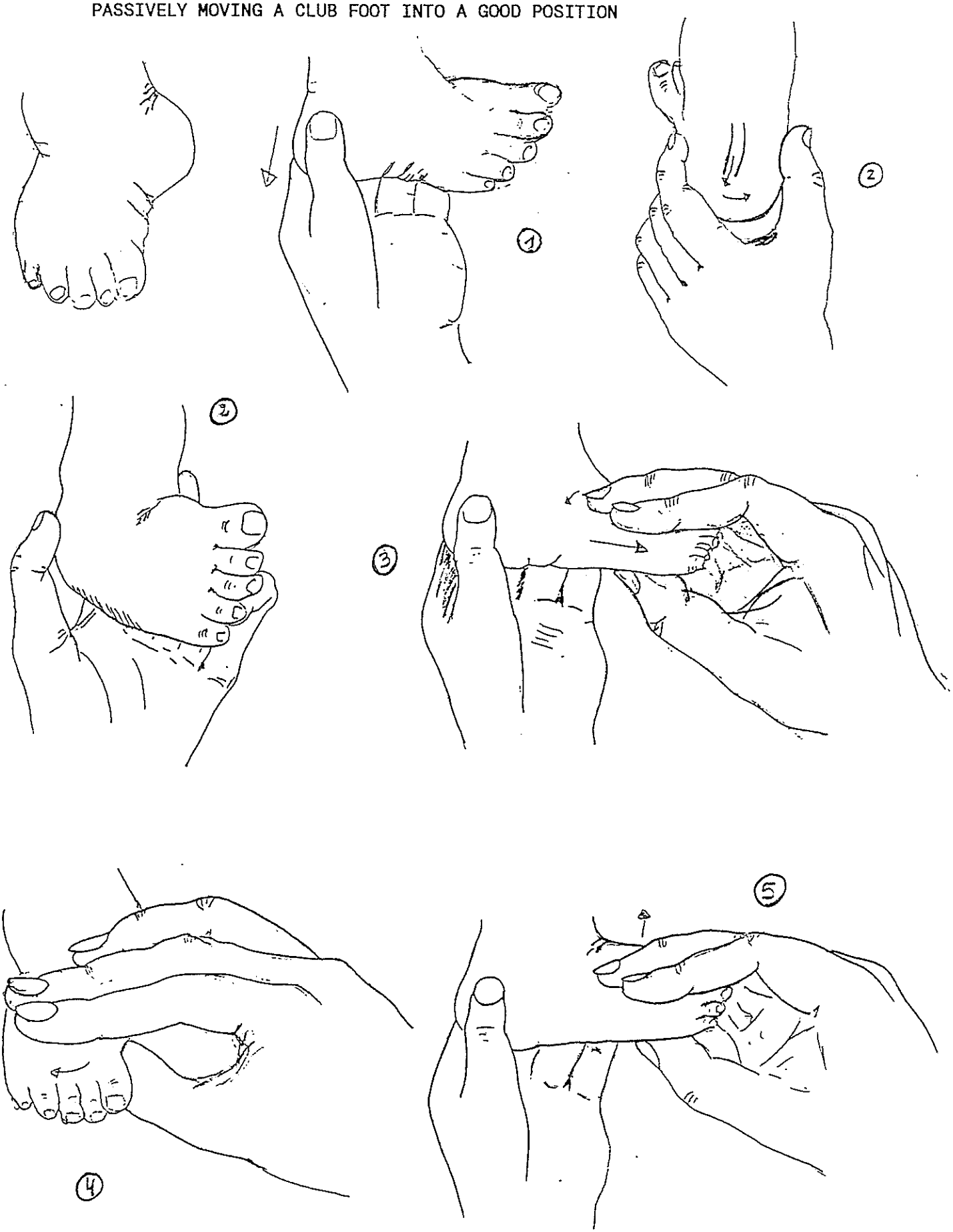
STEP 3: Distract forefoot (gently pull forefoot forward)

STEP 4: Gently push the talus posteriorly and correct forefoot adduction and inversion (gently move the forefoot outward)

STEP 5: Correct plantar flexion (gently pull calcaneus downward and push forefoot upward.

PICTURES OF EACH STEP ARE GIVEN ON THE FOLLOWING PAGE

PASSIVELY MOVING A CLUB FOOT INTO A GOOD POSITION



The PTA must demonstrate the correct passive positioning of the foot many times so the family can see.

The PTA must clearly explain each step and give good reason why each step is made in the way that it is.

The PTA must tell the family how many times this positioning should be made (10 times each treatment, 2-3 treatments each day).

The family must demonstrate foot positioning technique and the PTA can give positive feedback and suggestions for improvement.

Questions:

1. A mother does not understand why she must pull down on the heel bone before moving the heel to the outside. What will you say to this woman?

_____

_____

_____

2. A woman is afraid of the talus being in a bad position when moving the foot. With her finger she pushes very hard on the talus to keep it in a good position. Do you agree with this idea?

Yes _____ No _____

Explain your answer.

_____

_____

_____

General guidelines for moving the baby's foot

* The baby should be calm and relaxed. (Example: after feeding)

* The baby's knee should be flexed.

* Gentle movements and distraction are to prevent bone damage.

* Dorsiflexion is made <u>after</u> the heel and forefoot are corrected.

* Parents/family should be able to make these treatments.

* The foot should be put in a good position 10 times each treatment and the baby should have at least 2-3 treatments each day.

* At the end of the last movement, the foot should be held in this position to give a small stretch and prepare the foot for strapping.

<u>Activity</u>:

We have recommended to correct the club foot in the following sequence:

HINDFOOT ---> FOREFOOT ---> ANKLE

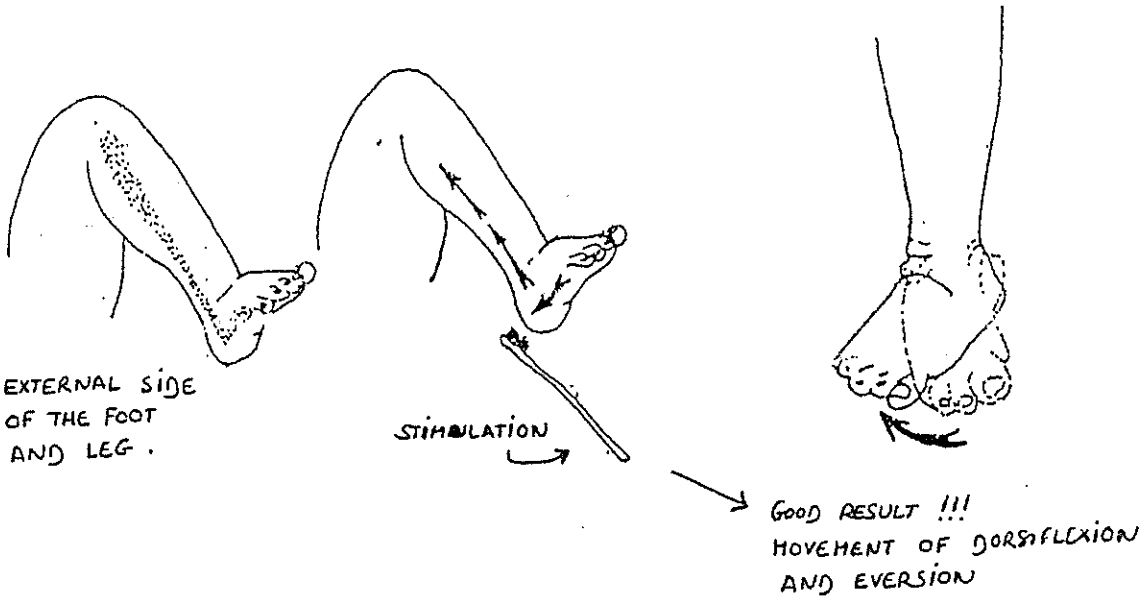
Together with your class discuss why not another sequence (Example: why not Forefoot ---> Hindfoot ---> Ankle, or Hindfoot ---> Ankle ---> Forefoot?

c. <u>stimulation and family teaching</u>

In club foot, the foot dorsiflexors and evertors are longer and weaker because of poor foot positioning and decreased use by the baby.

These muscles need STIMULATION (something to excite the muscles) to make them contract and become stronger.

As a result of stimulation, the foot should move in the direction of dorsiflexion and eversion.



Common areas to stimulate to increase dorsiflextion and eversion of the foot are:

- the external side of the foot
- the external side of the leg

Note: Any area can be stimulated; the PTA and family can test different areas to see what area will help increase active dorsiflexion and eversion.

The rhythm of stimulation should be varied. This variety will help to keep the muscles active.

Question:

You are stimulating the external side of the foot.
As a result the foot makes inversion (turns to the inside).
Is this the result you want?

Yes _____ No _____

What will you do to modify your treatment?

_____

_____

Remember:

* The PTA must demonstrate stimulation techniques and identify what movement should be the result.

* The PTA must clearly explain why stimulation helps the baby and how often it should be made (¨ 10 minutes, 2-3 times each day).

* The family must demonstrate stimulation technique and the PTA can give positive feedback and suggestions for improvement.

Questions:

1. A woman stimulates the thigh of the baby. The result is active dorsiflexion and eversion of the club foot. Do you agree with her treatment?

   Yes _____ No _____

   Explain your answer.

_____

_____

2. A man does not understand why it is important to have active dorsiflexion and eversion. He thinks positioning the foot is enough. What will you explain to this man?

_____

_____

_____

d) immobilisation and family teaching

Immobilization is used to prevent movement. (See FRACTURES chapter, Volume 3).

In club foot, immobilization is used to maintain the foot movement that you have made with other techniques.

All immobilization techniques are made AFTER passive movement and stimulation.

There are different ways to hold the foot in a good position without allowing movement. The type of immobilization used will depend on the type of club foot and the materials available.

The types of immobilization used to treat club foot are:

- Strapping
- St. Germain splint
- Plaster of Paris (POP)

Strapping

Strapping can be used for patients with Type I and Type II club foot.

Strapping for club foot is a technique that uses adhesive bandage (tape) and a hard sole.

The sole can be made of wood or rigid leather, or plaster.

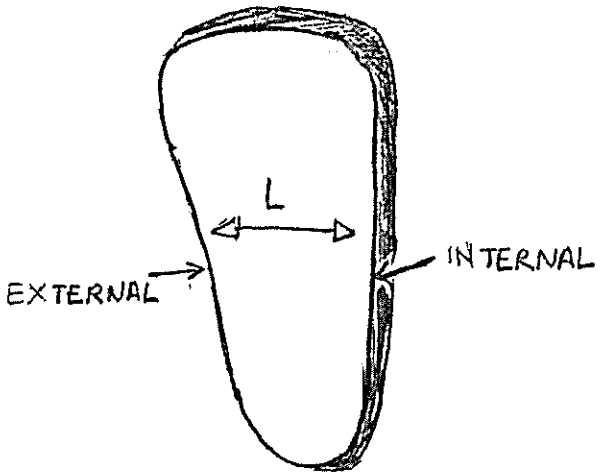
The sole should be the same size as the baby's foot.

The sole should be straight on the internal side.

This will help keep the baby's foot in a good position.

Strapping should be changed every day.

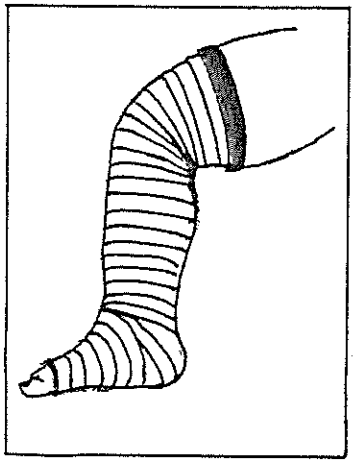
Strapping can be stopped when the foot is resting in a good position when the baby is relaxed.



Procedure to apply strapping

The PTA must follow the specific order given below.

1. protect the baby's skin with



* gauze bandage

The bandage should be wrapped around the areas that tape will be applied.

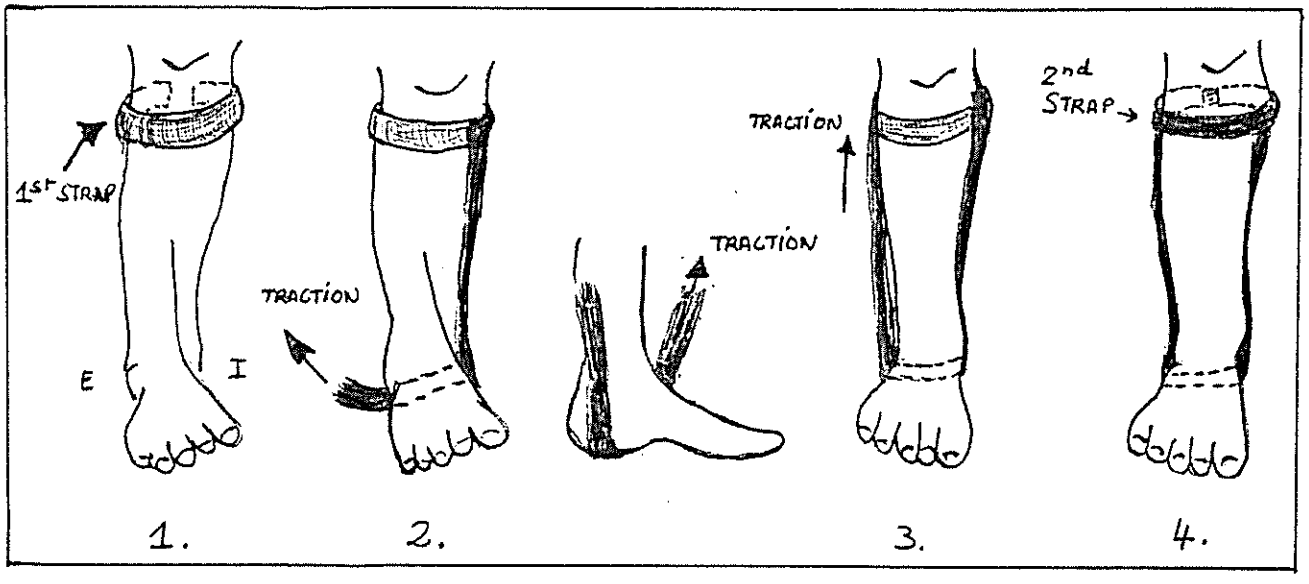
The ends of the gauze bandage are secured with tape (do not cover the baby's toes)

OR

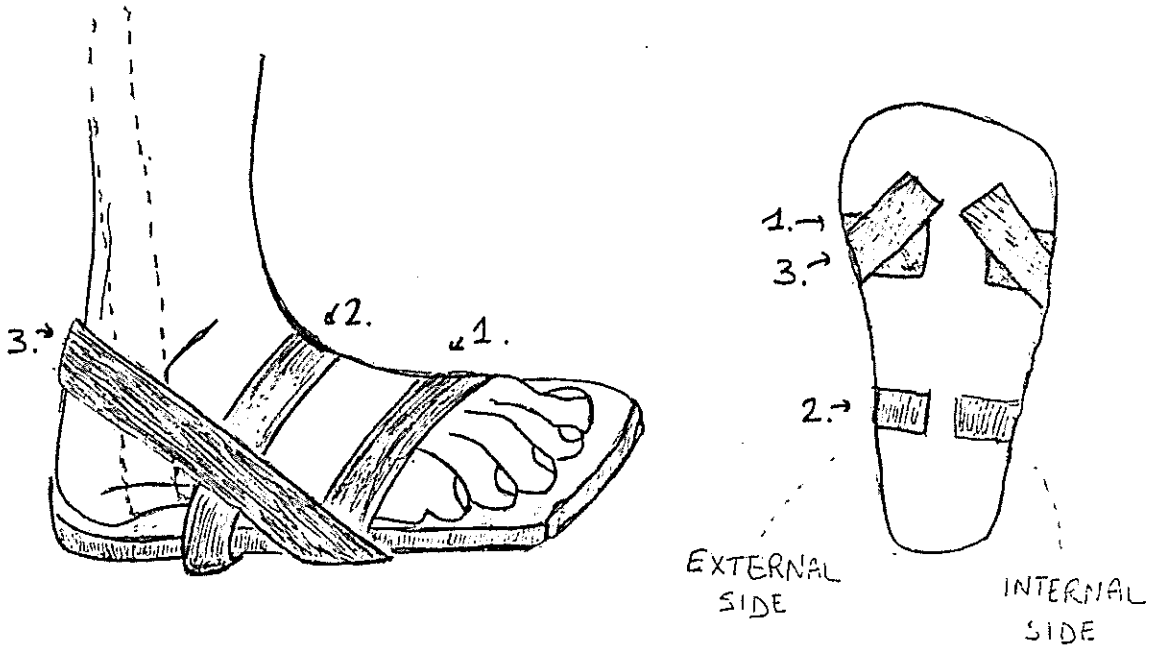
Tincture of Benzoin is a liquid that can be applied to areas where tape is used. This liquid helps to prevent skin damage.

2. put the heel and foot in a good position

* make sure the talus is in a good position before strapping.

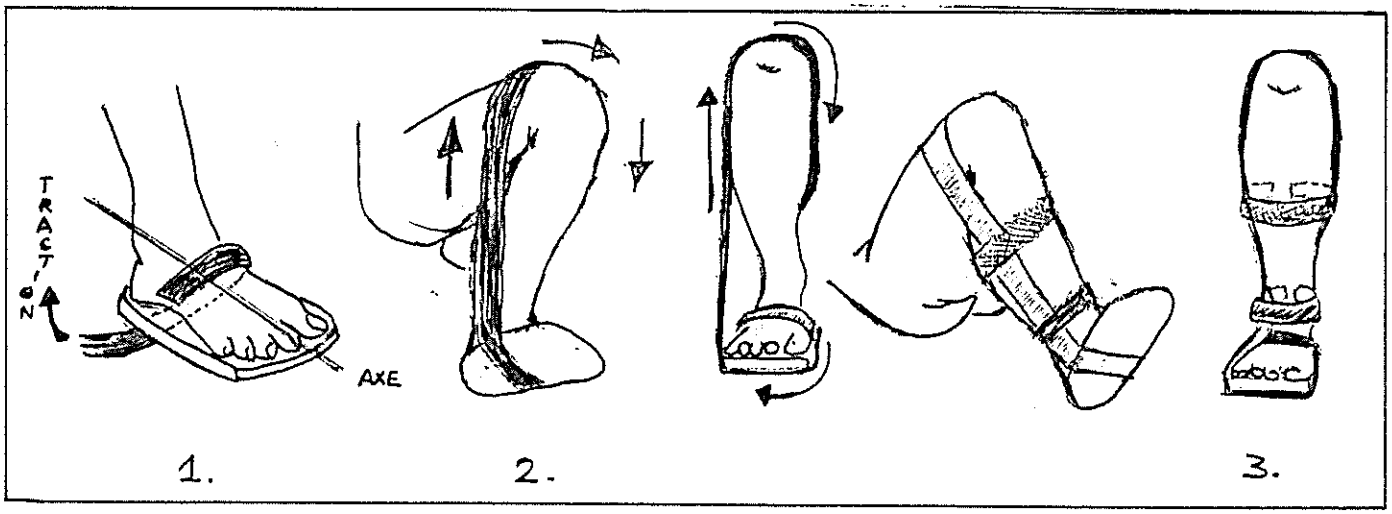


3. then attach the sole to the bottom of the foot.

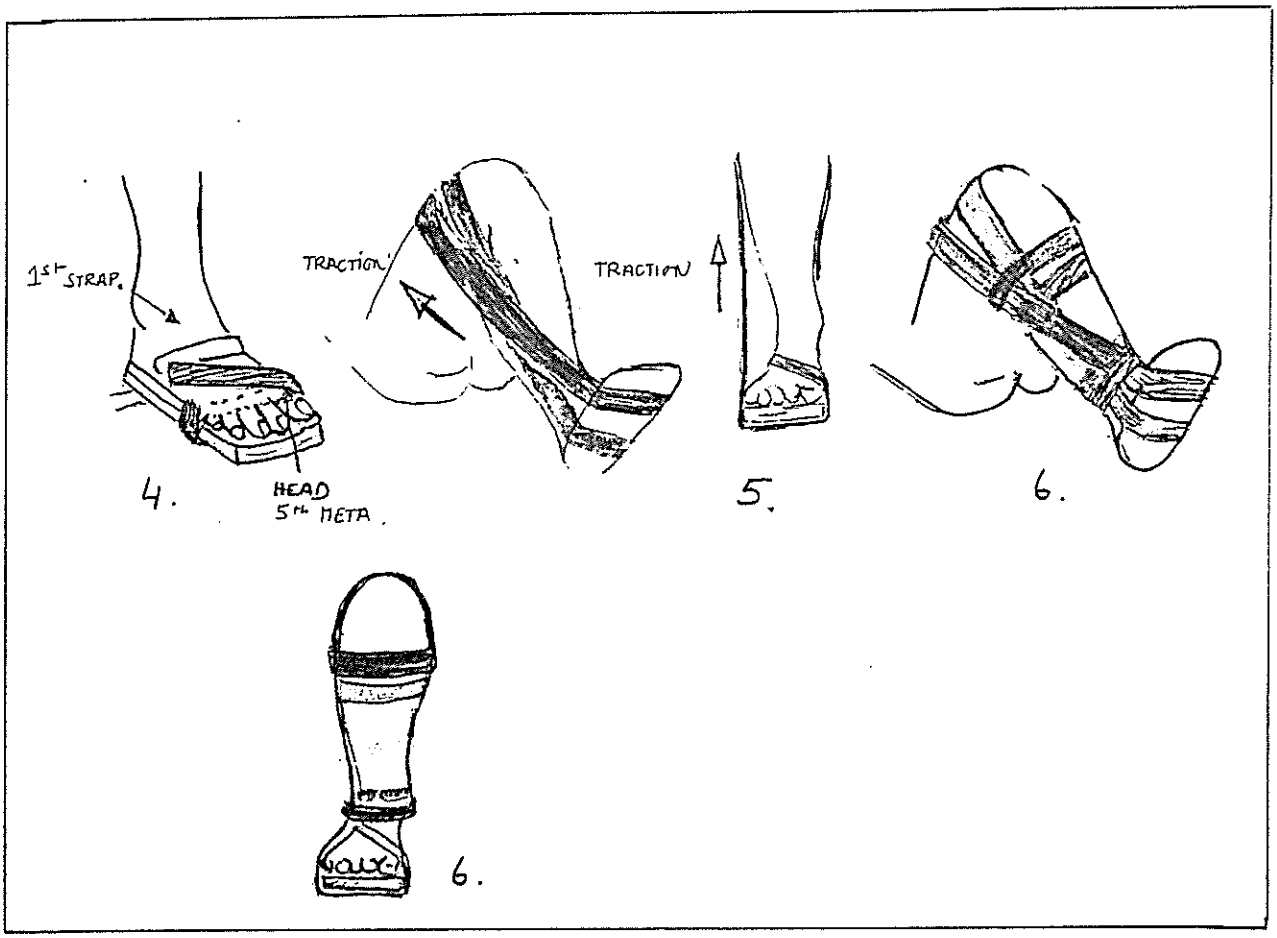


4. then immobilize the foot in a good position with knee flexion

<u>first bandage</u>



second bandage



Family teaching

The PTA must carefully explain why strapping is needed for the baby.

Strapping is a difficult technique. For this reason, the PTA will be responsible for applying and removing strapping.

If the PTA feels that the family can correctly and reliably apply strapping, he must take a lot of time to correctly teach this technique and observe the family apply strapping.

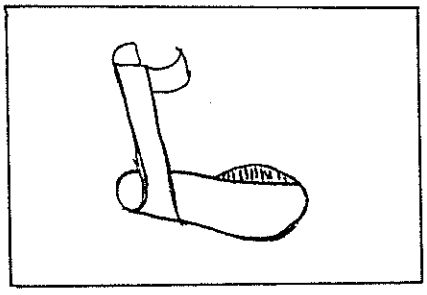
St. Germain Splint

St. Germain splint can be used for patients with Type I or Type II club foot.

The St. Germain splint is made out of one continuous piece of sheet metal or PVC tubing. If sheet metal is used, it must be padded well.

The St. Germain splint is attached to the baby's foot and leg with an adhesive bandage.

The splint has three different parts:



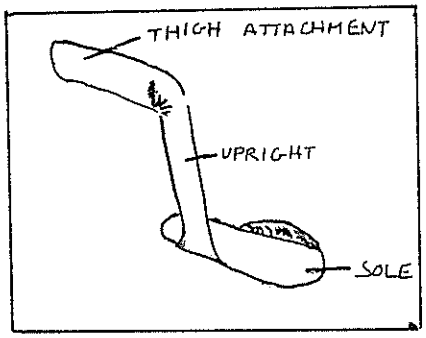
* A sole with a straight internal side.

  It may have a raised edge on the internal side to help keep the foot in a good position.

* An upright that attaches to the external side of the leg.

* Another part that attaches to the external side of the baby's thigh

  This part may be removed as the child progresses.



The splint is made to fit the child.

The sole of the splint should be the same size as the child's foot.

The upright should continue to the level of the knee joint. A relief is made to decrease pressure on the malleolus.

The thigh attachment should continue to just below the greater trochanter. The upright and thigh attachment should meet at a 90 degree angle.

The position of the sole in relation to the upright is adjusted to follow the progress of the child.

The use of the splint can be stopped when the foot is resting in a good position when the baby is relaxed.

Applying the splint

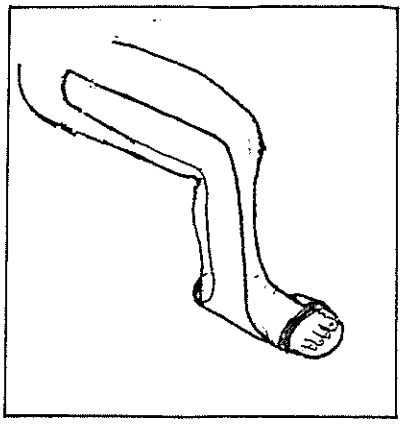
a) apply ticture of Benzoin or gauze bandages over areas where adhesive bandages will be applied

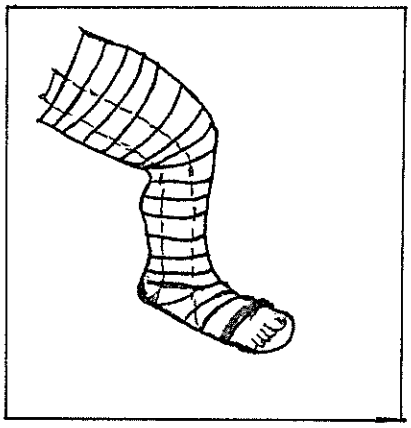
b) correct placement of the anterior part of the foot in the splint

c) apply adhesive bandage around this area

d) correct placement of the posterior part of the foot in the splint and apply the adhesive bandage

e) align the upright with the baby's leg and thigh and continue to apply the bandage until it is finished.





Removing the splint

The PTA and family must carefully check the skin after removing the splint. If there are red or dark areas, the shape of the splint must be modified to decrease pressure over these areas.

The St. Germain splint is very easy to make and to use.

It is highly recommended as an effective and very practical method of immobilization for children with club feet.

Family teaching

The PTA must demonstrate correct application of the St. Germain splint and explain why he makes each step.

The St. Germain splint is very easy to apply and the family should learn how to do this.

The family must demonstrate application of the splint and the PTA can give positive feedback and suggestions for improvement.

The splint can be removed when the child is receiving treatment (¨ 2 times each day) and must be re-applied at the end of each treatment.

Question:

The family makes a very good treatment for the child. They decide to let the child's foot be "free" for 2-3 hours before applying this splint.

Is this a good idea?

Yes _____ No _____

Explain your answer.

_____

_____

_____

_____

Plaster

Plaster is a type of immobilization that is used for very stiff feet (Type II) or when other immobilization techniques are not strong enough to hold the foot in a fixed position.

Special care must be used in applying and checking plaster immobilization. If incorrectly applied, plaster can cause severe damage.

Never make a plaster cast if the child lives more than two hours away from where you are working. This child will be difficult to check. If there is a problem with the plaster, it cannot be changed quickly and the child will have severe problems.

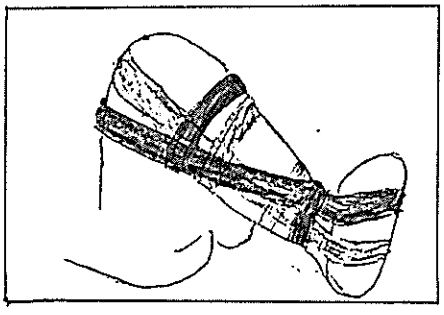
Method to apply plaster

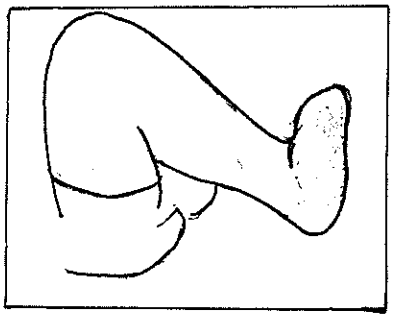
Review plaster application techniques, PLASTER chapter, Volume 2.

a) apply strapping as seen on page 20.

b) protect all bony areas with cotton padding.

c) apply plaster over the strapping; the plaster should not cover the toes and should continue above the knee.





d) do not push on the plaster or try to correct the foot position after you have applied plaster; this will cause pressure on the skin which may create wounds

Plaster of Paris should be changed at least 2 times each week.

Plaster can be stopped when the baby's foot can be controlled by strapping/splint or when the foot is relaxed in a good position.

Family teaching

The PTA will not teach the family how to apply plaster, but must teach the family how to:

* identify problems with plaster

  If the child's toes become swollen, cold, or blue, THE PLASTER IS TOO TIGHT.

  The family must remove the plaster immediately. (One method is to soak the plaster in water and then unwrap the bandage.)

* how to take care of plaster

  If the plaster becomes wet (from baby's pee or from bathing), it will become soft and begin to smell.

  To prevent this, a plastic bag can be put over the plaster to help keep it dry.

Disadvantages of plaster

* cannot move and stimulate the feet every day

* incorrect application will cause pressure sores (wounds)

* need a well trained team to apply plaster correctly

Questions:

1. What are the main problems with using plaster for immobilization?

2. Describe four differences between the St. Germain splint and strapping.

3. What type of immobilization is easiest for the family to use?

Questions:

1. Why do you not give plaster immobilization for babies with TYPE I club foot deformity?

_____

_____

_____

2. Why do you make immobilization for babies with club feet?

_____

_____

_____

4. Follow-up care for club foot patients

After the child's foot in the normal position, Physical Therapy does not stop.

The child must continue to do stretching and strengthening exercises to maintain good position and movements of the foot.

If the family and child stop making these exercises, most club feet will return to a bad position!

When the child begins to walk, he may need special shoes to help keep in the foot in a good position in standing.

Questions

A child received treatment for club foot when he was a baby. He is now 2 years old and continues to receive treatment.

1. What muscles need to be strengthened in the feet?

_____

_____

This boy received special shoes.

2. Will special shoes help to keep the foot in a position of <u>inversion</u> or <u>eversion</u>?

_____

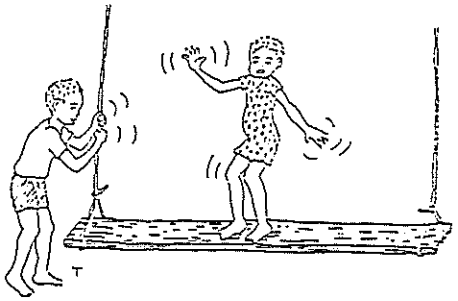
Explain your answer.

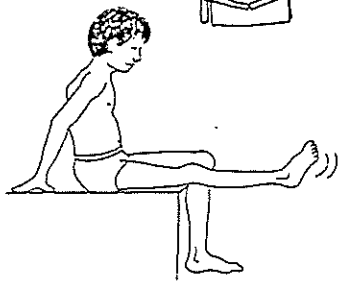
_____

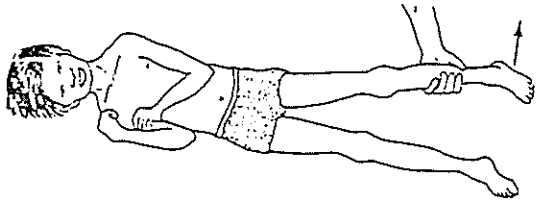
_____

_____

Below are pictures of different exercises that will help maintain good strength and position in the child's foot after treatment for club foot.







G. CHAPTER SUMMARY

Club foot is a congential deformity of one or both feet.

The deformity of the foot is a combination of:

- adduction of the forefoot
- inversion of the heel and forefoot
- plantar flexion of the ankle (equinus)

There are three different types of club foot. The types are named depending on the severity of the deformity.

- TYPE I = easy to correct (easy to put the foot in a normal position)
- TYPE II = possible to correct with difficulty; possible to correct incompletely
- TYPE III = impossible to correct (fixed)

The family must be involved in treatment of the child. They can help to give the treatments and help the child develop good habits.

The four main P.T. treatments used to treat club foot are:

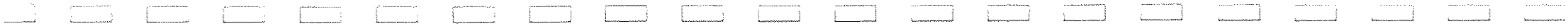
- massage - helps relax the child and build trust
- passively moving the foot into a good position (distraction, then correct HINDFOOT --> FOREFOOT --> ANKLE) - helps to stretch tissues and increase ROM.
- stimulations - used to help excite dorsiflexor and evertor muscles and make them work.
- immobilization (strapping, St. Germain splint, plaster) - are used to <u>maintain</u> ROM that has been increased by other techniques.

The PTA should remember to be gentle with the baby's foot because it can be easily damaged.

Follow-up care is needed for these patients for exercises and shoes.

27.

HEMIPLEGIA



HEMIPLEGIA is loss of controlled movement and decreased feeling in one side of the body.

OBJECTIVES

At the time of the exam and with 80% proficiency, the student will be able to correctly:

1. describe hemiplegia (causes and symptoms).

2. identify the 3 different stages of hemiplegia and what happens in each stage.

3. describe flaccidity and spasticity.

4. evaluate a hemiplegic patient and identify problems that Physical Therapy can help.

5. demonstrate the appropriate Physical Therapy treatment for hemiplegic patients in different stages of recovery.

CHAPTER CONTENTS

A. INTRODUCTION

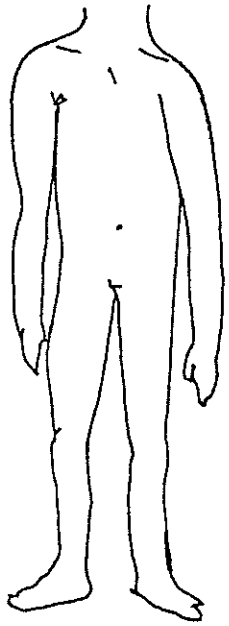
Hemiplegia is a problem of the central nervous system. The PTA should study the nervous system (see NEUROLOGY chapter, Volume 1) before beginning this chapter.

B. WHAT IS HEMIPLEGIA

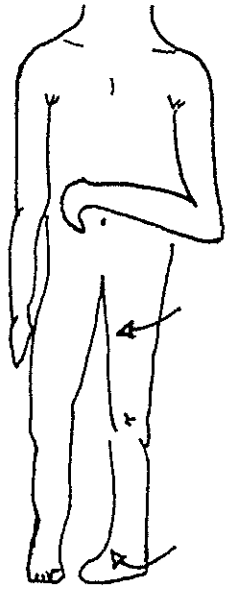
Hemiplegia is <u>loss of controlled movement</u> and <u>decreased feeling</u> in ONE SIDE of the body. Hemi = half

Loss of movement can mean:

NO MOVEMENT
(flaccid paralysis)
Flaccidity



UNWANTED/EXTRA MOVEMENT
(spastic paralysis)
Spasticity



Questions:

1. A patient has no movement in the right arm. All other body parts are normal. Does this patient have complete hemiplegia?

   Yes _____ No _____

2. A patient has spasticity in both legs. What does spasticity mean?

   _____

   _____

3. A patient has a flaccid left arm and a flaccid left leg. What does flaccid mean?

   _____

   _____

   Could this patient have hemiplegia?

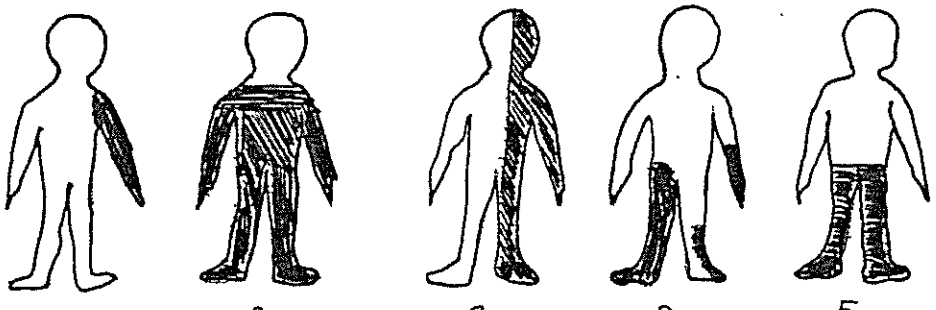
   Yes _____ No _____

4. A patient has paralysis in the right side of the body. Describe 3 general problems this patient will have in a normal day.

   _____

   _____

5. Below are pictures of different patients. The dark areas are the areas that have uncontrolled movement. Please identify what pictures could be patients with hemiplegia.



C. CAUSE OF HEMIPLEGIA

The cause of hemiplegia is <u>damage to one side of the brain</u>.

Brain damage can be caused by:

TRAUMA

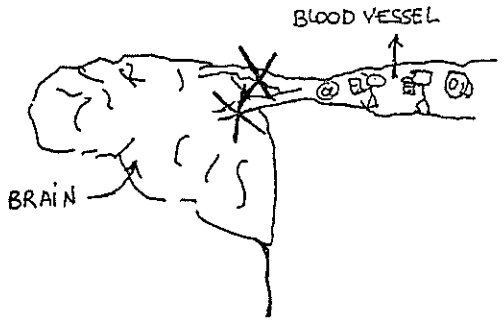
* direct hit to the head.

DECREASED CIRCULATION

* Blood travel is blocked. Food and oxygen cannot arrive at a part of the brain and it becomes weak and dies.

DISEASE

* Disease may attack one area of the brain more than another area.



<u>Questions</u>:

1. If there is damage on the right side of the brain, what side of the body will have a problem?

   _____

2. A patient has <u>right</u> hemiplegia. What side of the body has abnormal movement and feeling?

   _____

   What side of the brain has been damaged?

   _____

D. SPECIFIC INFORMATION ABOUT HEMIPLEGIA

Information provided in this section includes:

1. The stages of hemiplegia (descriptions and explanations are given for each stage).
2. Different problems of hemiplegic patients.

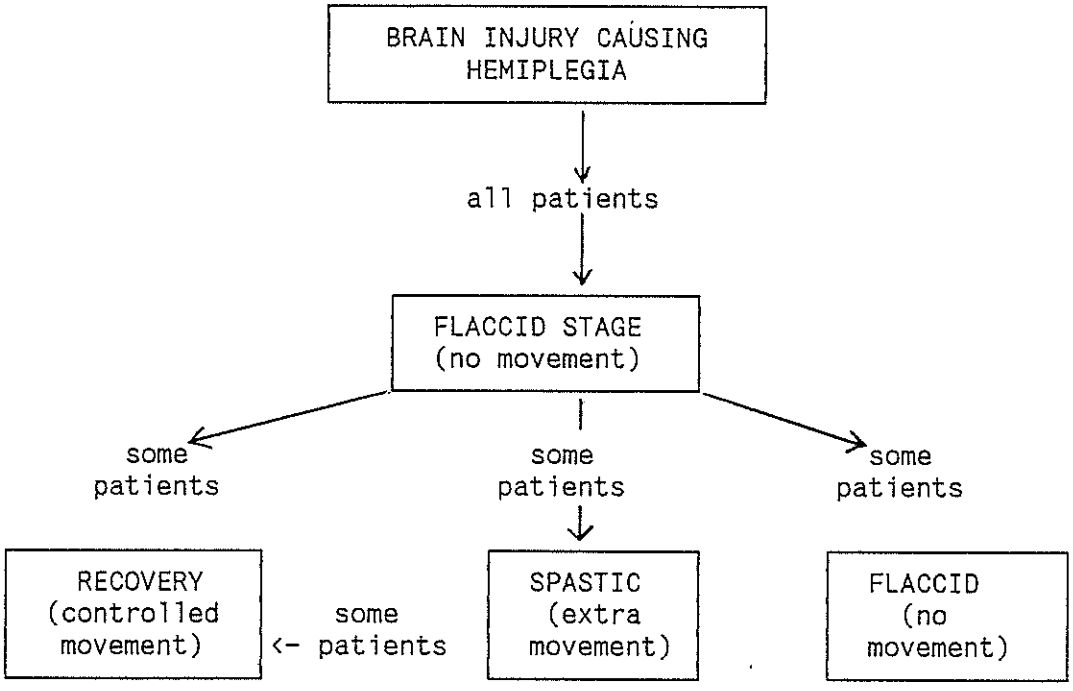
1. THE STAGES OF HEMIPLEGIA

There are 3 stages of hemiplegia:

a. FLACCID STAGE (NO MOVEMENT)

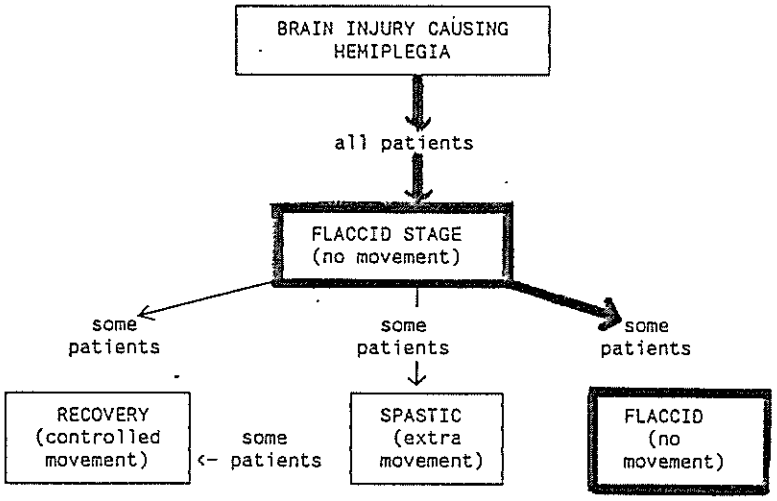
b. SPASTIC STAGE (UNCONTROLLED, EXTRA MOVEMENTS)

c. RECOVERY STAGE (REGAIN CONTROLLED MOVEMENT)



For each stage we will give a description of what you may see and an explanation of why this may happen.

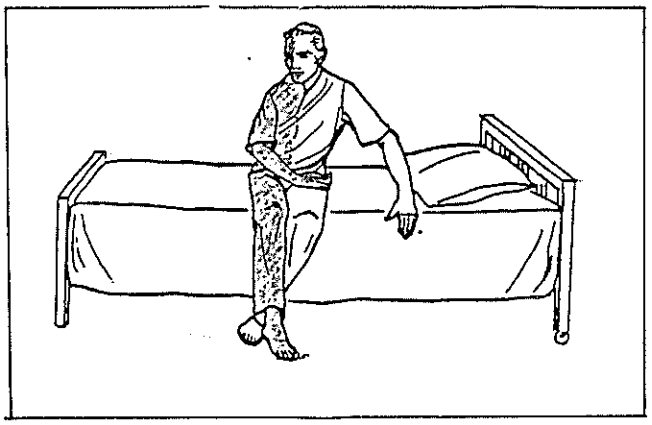
a. FLACCID STAGE (NO MOVEMENT)



Description of Flaccid Stage

Just after damage to the brain, muscles on one side of the body will make no movement.

This can include muscles of the face, tongue, trunk, upper limb and lower limb.



Another word used to describe flaccid is "floppy".

A part that is flaccid (floppy) feels very heavy and loose.

Some patients will describe a flaccid limb as a "dead" limb. The limb is not dead, but it has no muscle movement to show that it is alive.

Flaccid stage can continue for some days, weeks or months. In some patients (not often), a part may remain flaccid forever.

Explanation of why flaccid stage happens

Normally the brain is very active.

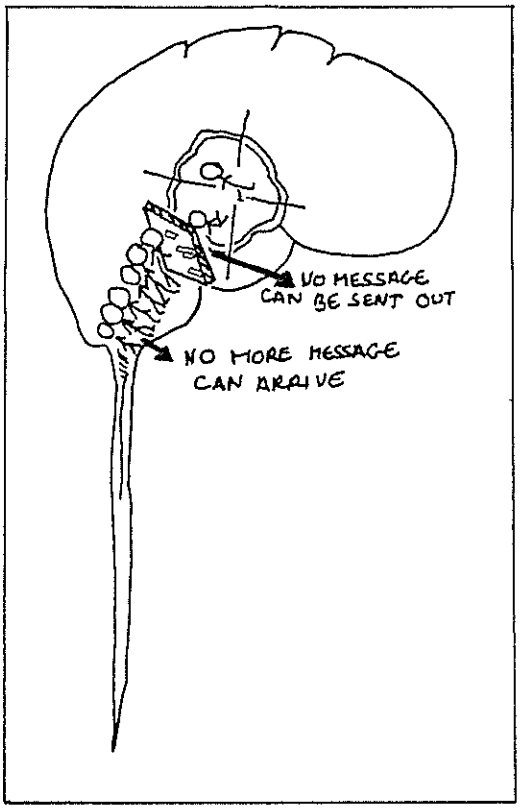
The brain makes messages, sends messages and receives messages.

If there is damage to a part of the bain, this area will stop working.

This damaged area cannot make messages for a part of the body.

This damaged area cannot send messages to a part of the body.

This damaged area cannot receive messages from a part of the body.



THIS IS THE FLACCID STAGE.

Questions:

1. After brain injury, the part of the brain that is damaged cannot make or send messages to a part of the body. What will this part have problems with, movement or feeling?

   _____

   Explain your answer.

_____

_____

_____

_____

2. In your own words, describe why hemiplegic patients in flaccid stage may also have problems with sensation (feeling) in the flaccid limb.

_____

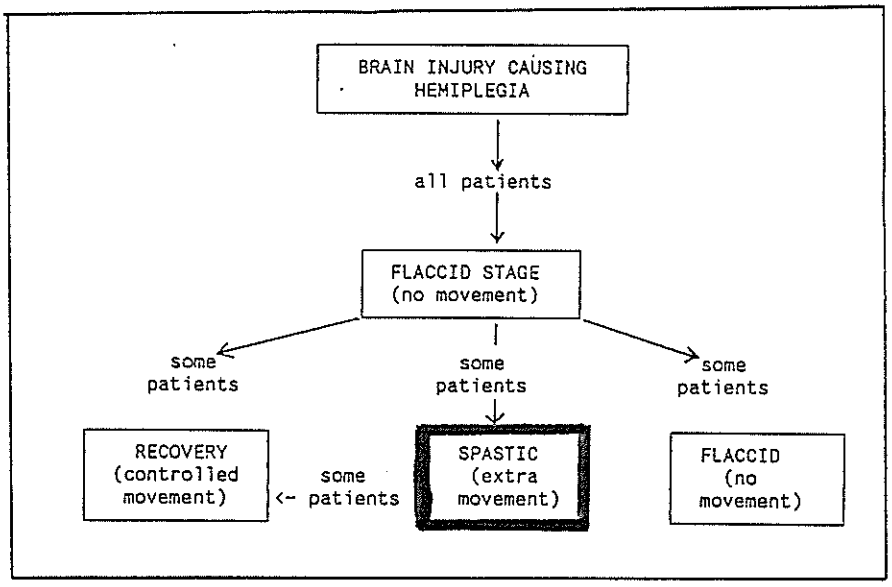
_____

_____

_____

_____

b. SPASTIC STAGE (UNCONTROLLED, EXTRA MOVEMENT)



Description of Spastic Stage

After flaccid stage, some patients may begin to have uncontrolled movement in the arm and leg. Uncontrolled, extra movement is called Spasticity.

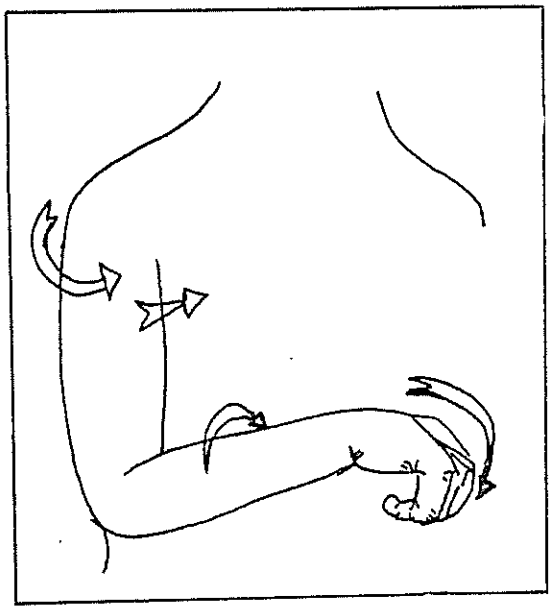
Spasticity in hemiplegia is seen in many muscles at the same time. This is called "group spasticity".

Group spasticity means that the uncontrolled movement of the upper limb or lower limb do not happen to only one muscle; spasticity is seen in many muscles at the same time.

In hemiplegic patients, "group spasticity" generally appears in the stronger muscles of the upper and lower limb.

Common "group spasticity" in the upper limb is:

shoulder:	adduction, internal rotation
elbow:	flexion
forearm:	pronation
wrist:	flexion
fingers:	flexion, adduction
thumb:	flexion, adduction

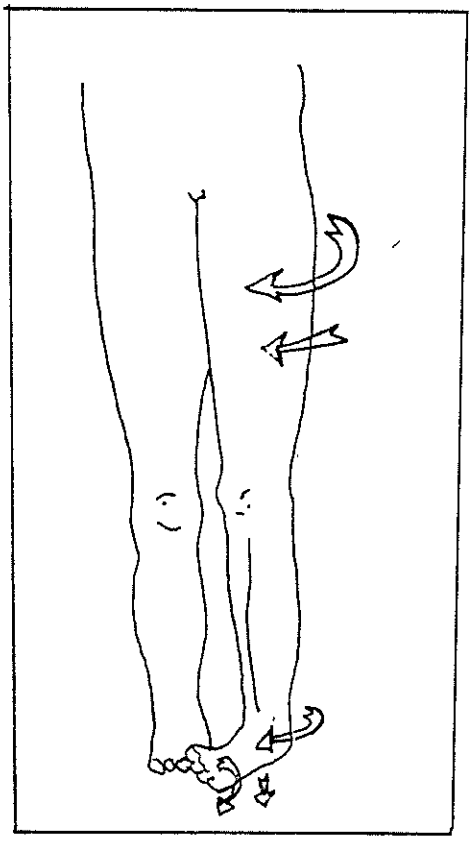


NOTE:

Not all patients will look this.
Some patients may have diferrent muscles
included in "group spasticity".

Common "group spasticity" in the lower limb is:

hip:	extension, internal rotation, adduction
knee:	extension
ankle:	plantarflexion
foot:	inversion
toes	flexion, adduction

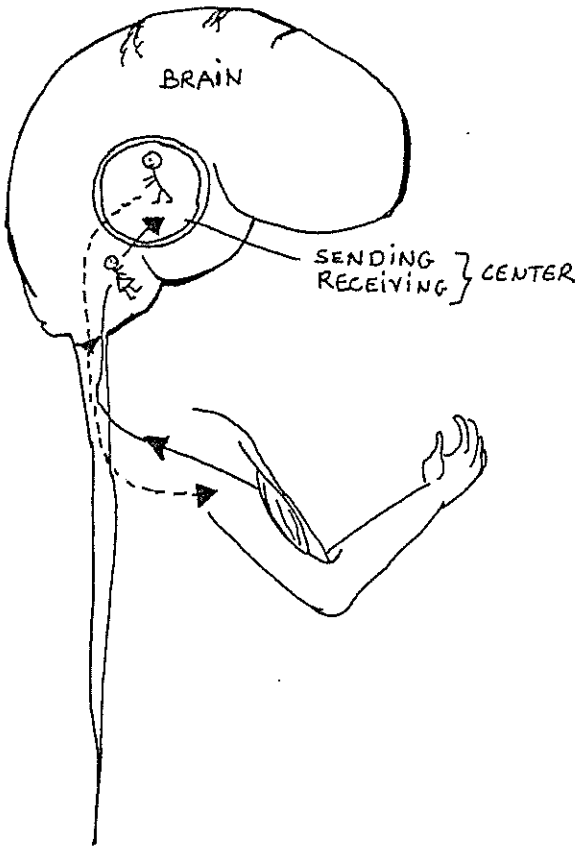


NOTE:

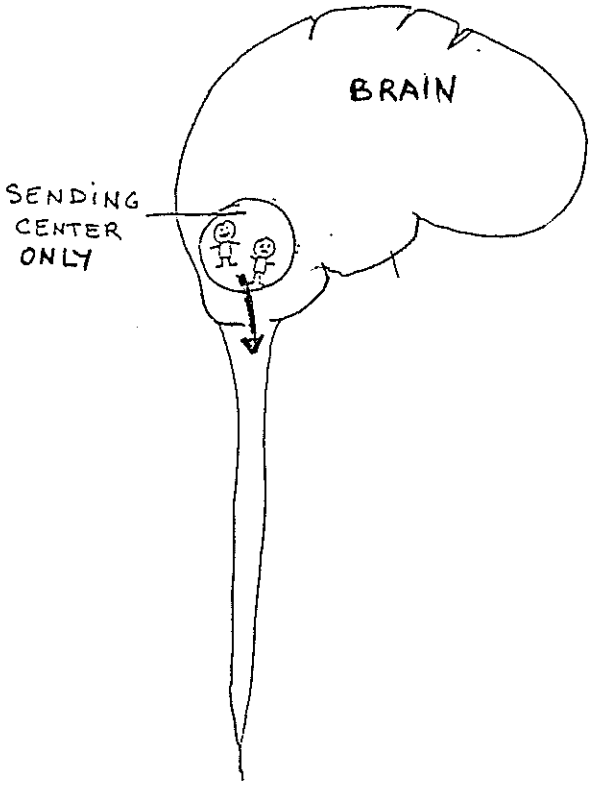
Not all patients will look this.
Some patients may have diferrent muscles
included in "group spasticity".

Explanation of why flaccid stage happens

We have said that the brain can make, send, and receive messages to and from all parts of the body.



There is a special part of the brain (special sending area) that would like only to send messages to the muscles all of the time to tell them to work.

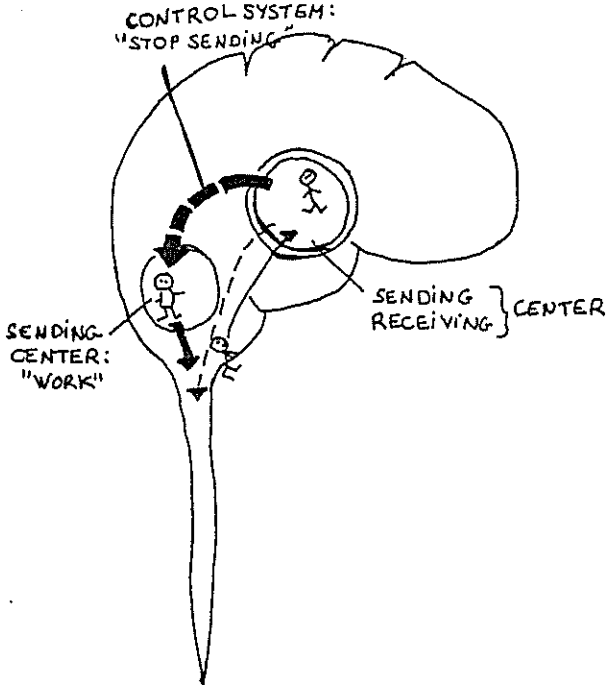


Question:

If this special part of the brain was free to send messages all of the time, would ALL MUSCLE ACTIVITY be increased or decreased?

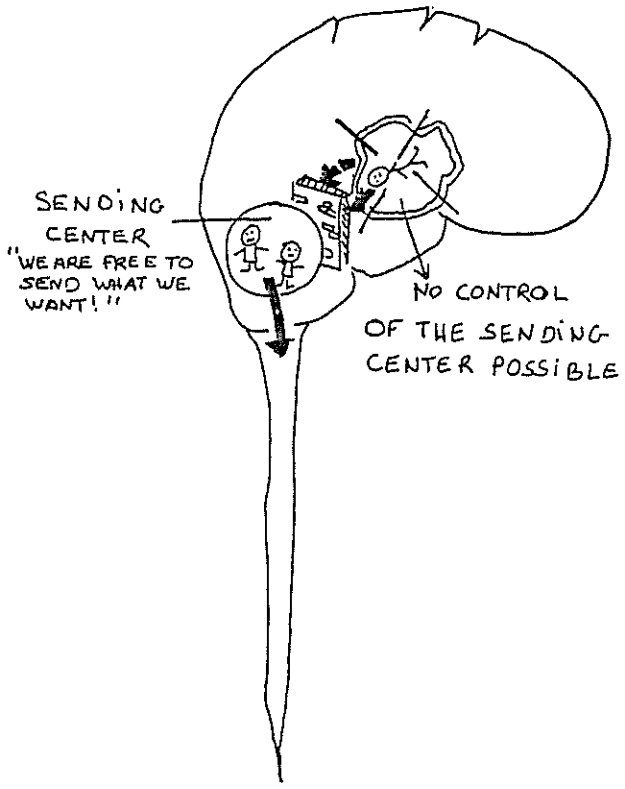
Explain your answer.

To help CONTROL muscle activity, a part of the brain must INHIBIT (stop) many of these messages.



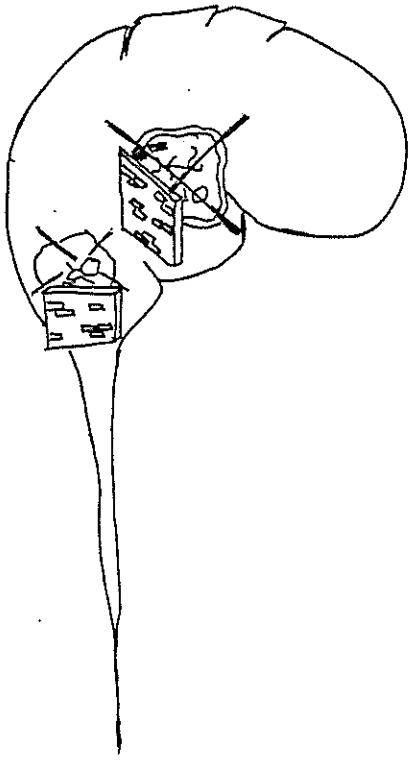
Question:

If a part of the brain inhibits these messages there is more controlled muscle movement. Explain why.



When the damaged part of the brain is the "inhibiting part", the inhibiting part stops working.

The "special sending area" is free to send many messages and the result is uncontrolled movement (spasticity) in specific muscles.



If brain damage is so severe that the "inhibiting part" and the "special sending area: are both damaged, then the patient will remain FLACCID.

Questions:

1. A patient has right hemiplegia.

   * What side of the body has a problem with feeling?

   _____

   * What side of the brain has been damaged?

   _____

2. After 2 weeks, the patient in Question 1 begins to have spasticity (uncontrolled movement) in the right arm. Explain why this happens.

_____

_____

_____

_____

3. Do you expect the patient in Question 1 to develop spasticity in the left arm?

   Yes _____ No _____

   Why or why not?

_____

_____

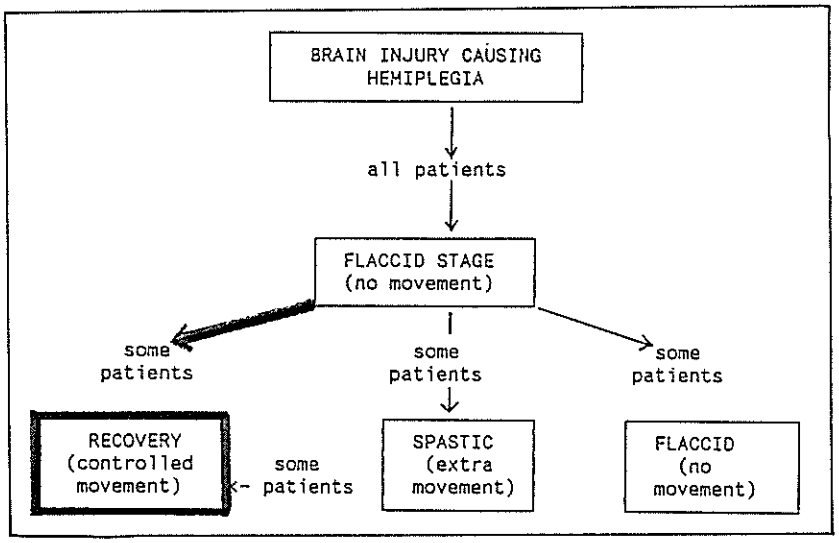
_____

_____

4. The patient in Question 1 also has a FLACCID lower limb. Is this flaccidity on the left side or the right side?

   _____

c. RECOVERY STAGE (REGAIN CONTROLLED MOVEMENT)



Description of Recovery Stage

The patient has relearned how to make individual movements, and the brain has been retrained on how to control different movements.

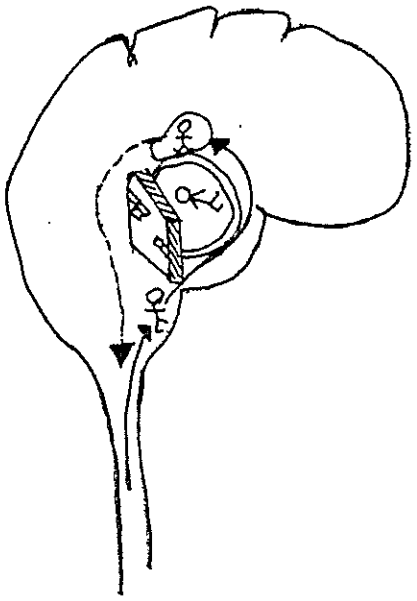
In some patients where brain damage is severe, individual movements of some body parts may never be possible (flaccidity or spasticity may remain forever).

Most recovery happens in the first six months after brain injury. Some recovery may continue even after many years, but this is not common.

Explanation of why Recovery Stage happens

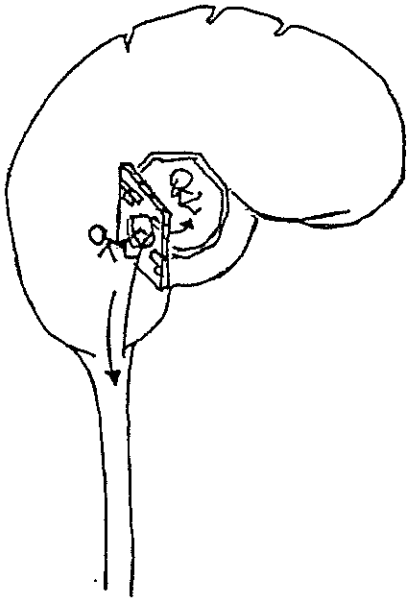
Areas of the brain that have died (been completely destroyed) will not recover.

There are three ideas that help explain how a patient may be able to recover individual movements after an injury to the brain.



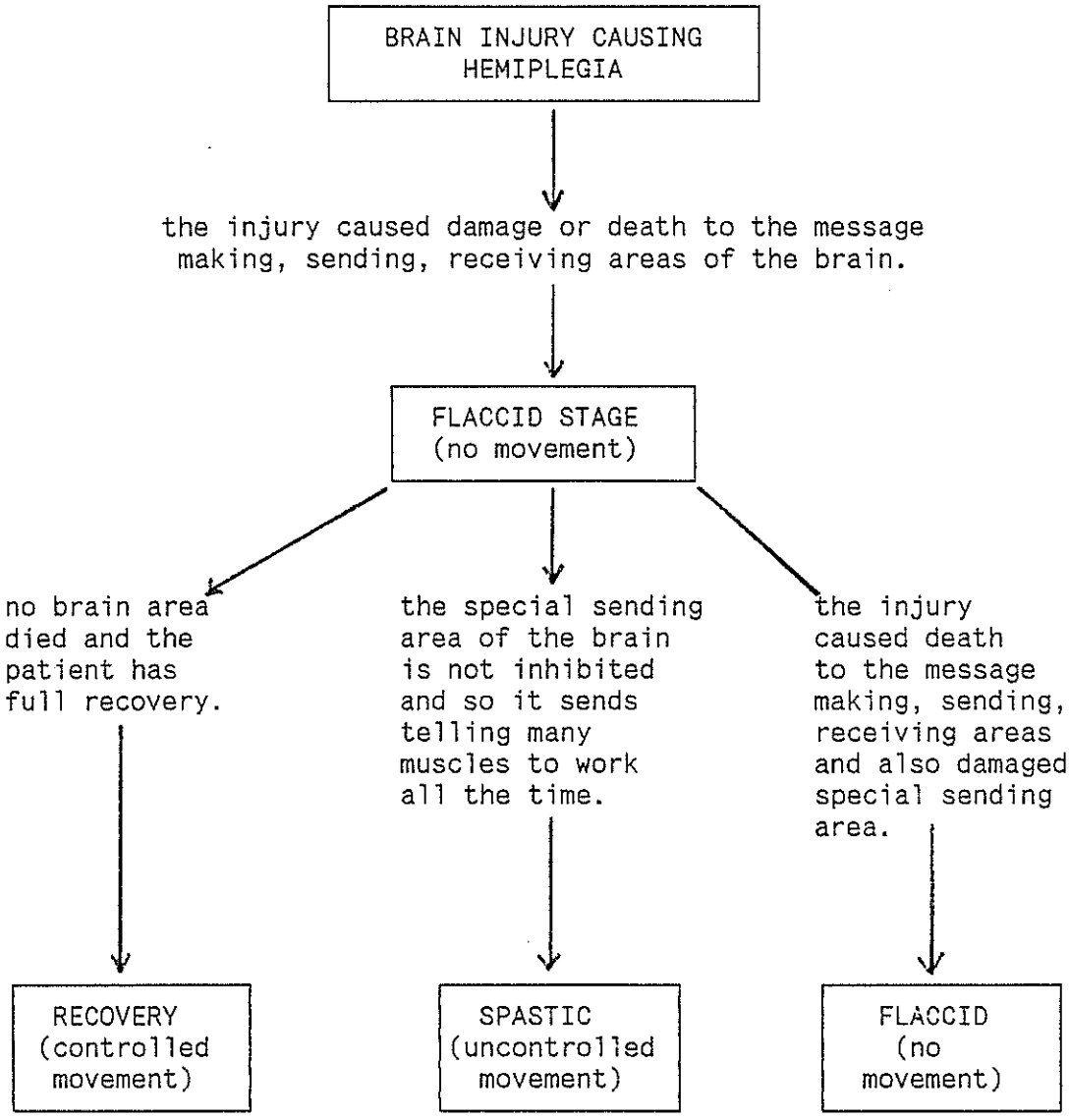
i) areas that are <u>close</u> to the brain-dead area may try to help and do some of the work that this area would normally do.

ii) Some areas that had only small injury (or pressure from swelling) and did not die may recover to normal function.



iii) Through <u>practice</u> and <u>retraining</u> the patient may be able to <u>control</u> some of the "group spasticity" muscles.

SUMMARY OF THE 3 STAGES OF HEMIPLEGIA



an injured part recovers, or areas close to the brain-dead areas help with the work, or the patient relearns how to make individual movement through lots of practice.

Notes:

- The length of time for each stage is different in all patients
  Example: flaccid stage may be 1 week in one patient and may be 3 weeks in another patient

- A clear beginning and end of the stages cannot be seen; often many of the stages can be seen at the same time
  Example: a man may have controlled movement in the right hip, spasticity in the right foot, and flaccidity in the right arm.

- Not all patients will have controlled movements. Many hemiplegic patients may continue to have some spasticity for the rest of their lives.

2. DIFFERENT PROBLEMS OF HEMIPLEGIC PATIENTS

As we have said before, hemiplegic patients will have problems with movement and feeling on one side of the body.

This may include movement and feeling in the face, mouth, tongue, trunk and limbs on that side.

Activity:

You have just met a patient with left hemiplegia. There is no movement in the muscles of the left face, mouth, tongue, trunk, arm and leg.
Describe five problems that this patient will have in a normal day.

_____

_____

_____

_____

_____

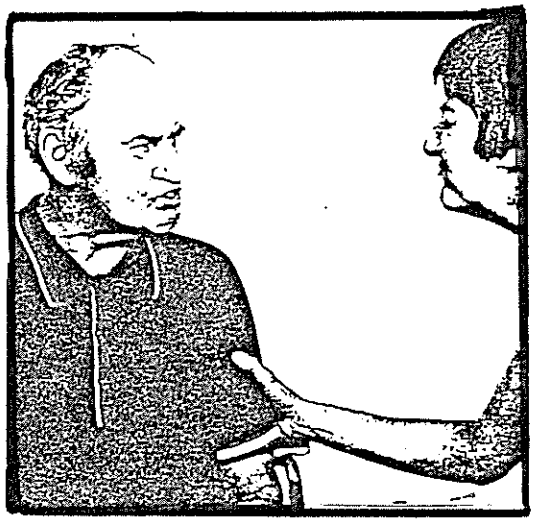
In addition to problems with movement and feeling, the hemiplegic patient may also have problems with

* speaking
* "knowing" one side of the body
* following directions
* controlling emotions

* SPEAKING

The language area (the area that gives you the ability to speak) is on the LEFT side of the brain only.

If the language area is damaged, the patient will be able to understand what you say, but is <u>not able to speak</u>.



Questions:

1. What type of hemiplegic patient will have a problem with speaking (right hemiplegic or left hemiplegic)?

_____

Questions: (continued)

2. A patient with hemiplegia cannot speak. The PTA stops speaking to the patient and uses hand movements to communicate with the patient.
Is this a good idea? Yes _____ No _____

Explain your answer.

_____

_____

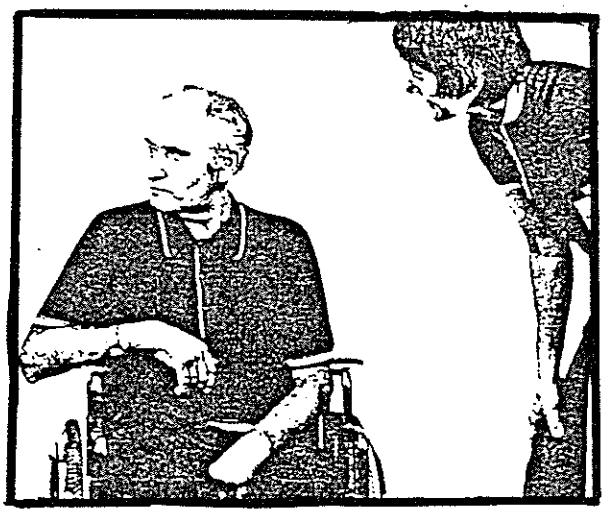
_____

* "KNOWING" ONE SIDE OF THE BODY

The patient with hemiplegia may not remember, recognize, know or see the hemiplegic side of their body.

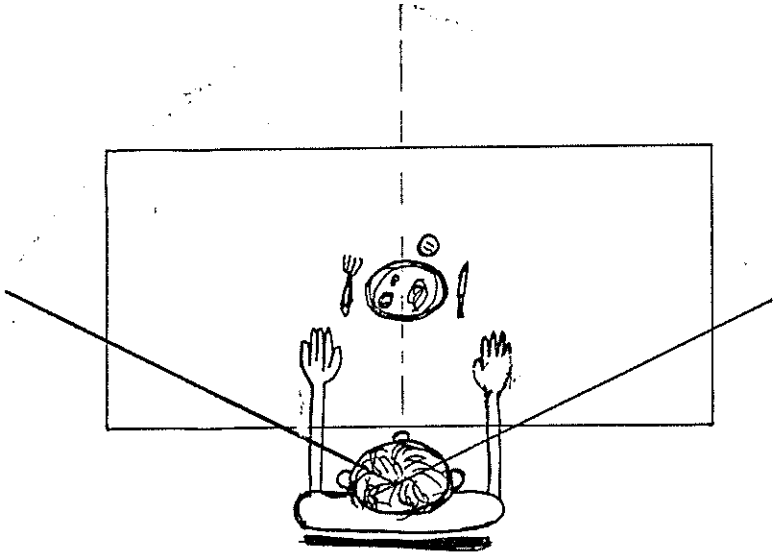
The brain is not making or sending messages to this area and is not able to receive messages from this area.

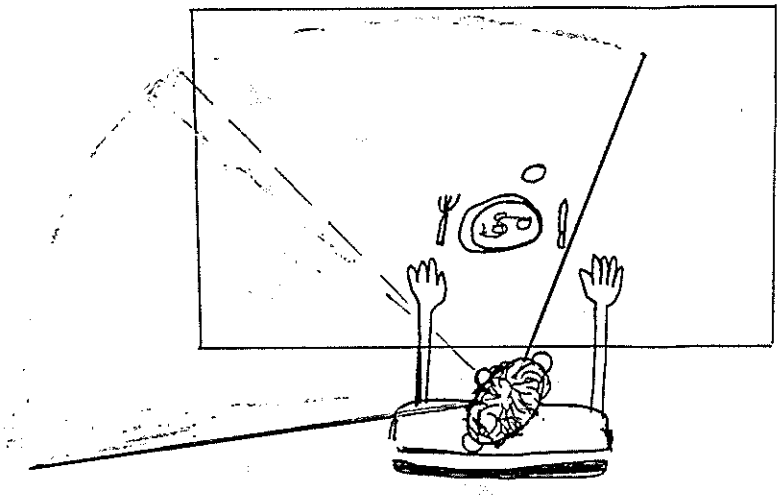
With no messages arriving to and from the hemiplegic side, the patient can easily "forget" that this side continues to be a part of his body.



For some patients, the brain may be damaged in such a way that the patient does not "see" the area or objects on the hemiplegic side.

Example:





* FOLLOWING DIRECTIONS

In some patients, the brain has been damaged so that it may be difficult for the patient to follow directions or understand simple conversation.

* CONTROLLING EMOTIONS

After the brain has been damaged, the patient may become very sensitive and may easily be angry, cry, laugh or shout.

The PTA must remember that these behaviors may be difficult for the hemiplegic patient to control.

IN SUMMARY

The different problems of a hemiplegic patient are caused by damage to or death of a specific part of the brain.

Our body is one complete whole. When a part of it is damaged, the "normal" areas cannot remain the same. These areas may need to do more work, adapt their work, or help to retrain the damaged areas.

It is important to remember that a hemiplegic patient is not just a paralyzed arm and leg.

There may be many other problems caused from damage to the brain and we must always work with the whole patient.

E. MEDICAL TREATMENT OF HEMIPLEGIA

Medical treatment for hemiplegia is medicine given to:

* make the blood thinner: this will prevent the blood from being blocked in the arteries and veins

* try to decrease pain (if the patient complains of pain)

* try to decrease spasticity (this medicine will also make the patient very sleepy)

In general, MEDICINE WILL NOT HELP THE PATIENT RECOVER CONTROLLED MOVEMENT.

Controlled movement can happen only with practice and retraining muscles on the hemiplegic side of the body.

It is the responsibility of the PTA to work closely with the patient to help retrain muscles and practice controlled movements.

F. PHYSICAL THERAPY EVALUATION OF PATIENTS WITH HEMIPLEGIA

The PTA must carefully evaluate the patient to identify changes in movement and function.

FLACCID PERIOD

* sensation (what areas have decreased feeling or no feeling?)
* what areas are completely flaccid (do some areas have a little muscle tone?)
* pain
* range of motion
* functional ability of patient (moving in bed, sitting, eating)
* mentation (can the patient follow directions or understand you?)
* awareness of the hemiplegic side of the body

SPASTIC PERIOD

* sensation
* pain
* range of motion
* group spasticity (where, how strong, when do you see it?)
* flaccid areas
* functional ability of the patient (moving in bed, sitting, transfers, standing)
* mentation, and awareness of hemiplegic side of the body

RECOVERY PERIOD

* sensation, pain, range of motion
* amount of controlled movement that the patient has (movements that are not in a group pattern)
* group spasticity areas
* functional ability of the patient (standing, walking, dressing)
* flaccid areas
* equipment needed to help patient be more functional and independent in every day activities

F. PHYSICAL THERAPY TREATMENT OF PATIENTS WITH HEMIPLEGIA

RULES TO REMEMBER IN TREATING ALL HEMIPLEGIC PATIENTS

* Weakness is NOT the main problem, NO CONTROL of movement is the main problem.
* The PTA should NOT muscle test a patient with hemiplegia and NOT work to "strengthen" the hemiplegic side. The patient must learn to control individual movements.
* The whole person needs treatment to help both sides of the body to work together again.

Specific Physical Therapy treatments will be discussed for each stage of hemiplegia.

1. PHYSICAL THERAPY TREATMENT IN FLACCID STAGE
2. PHYSICAL THERAPY TREATMENT IN SPASTIC STAGE
3. PHYSICAL THERAPY TREATMET IN RECOVERY STAGE

1. PHYSICAL THERAPY TREATMENT IN FLACCID STAGE

Physical Therapy treatment should begin as soon as possible after a patient has hemiplegia.

Physical Therapy treatment during this stage includes:

a. good patient positioning

b. orient the patient to the hemiplegic side of the body

c. psychological support

d. maintain ROM

e. practice functional movements

f. balance exercises

g. stimulate movements not expected in group spasticity

h. provide wheelchair

a. good patient positioning

Good positioning for the hemiplegic patient in flaccid stage is important to help:

* keep the joints in a good position
* avoid spasticity
* support the joints that flaccid muscles cannot support
* encourage the patient to look on the hemiplegic side

In this section will will describe:

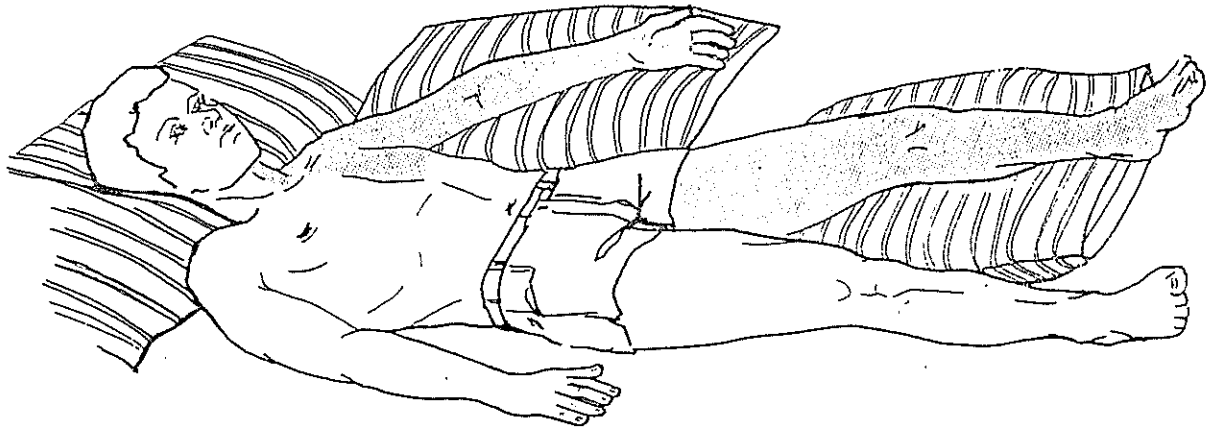
i) suggested bed positions

ii) suggested sitting positions (wheelchair, table, bed)

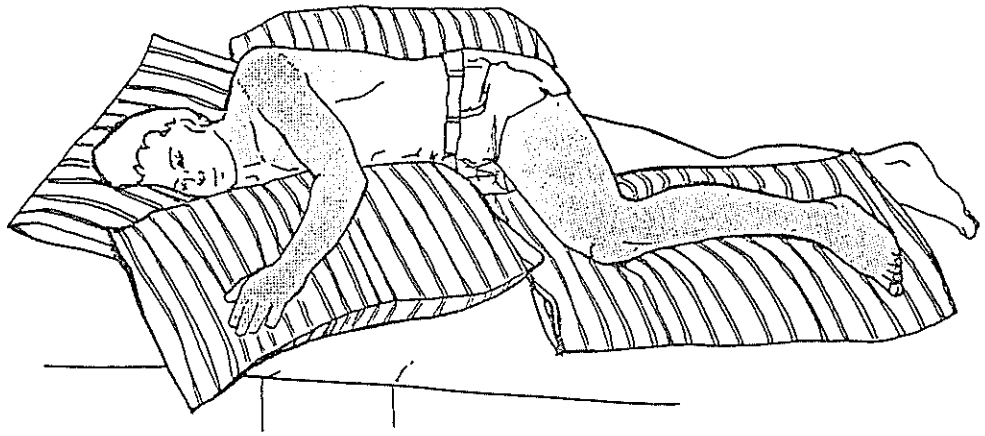
iii) equipment to help with positioning

i) **suggested bed positions**

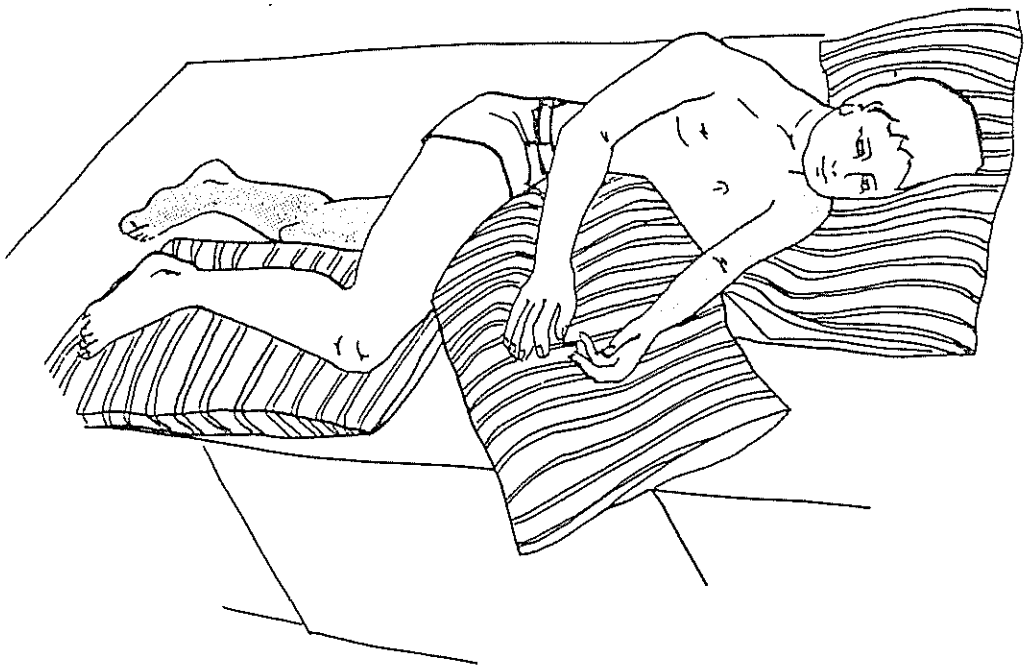
Below are pictures of recommended positions for patients in bed.



Supine position



Side lying on the unaffected side



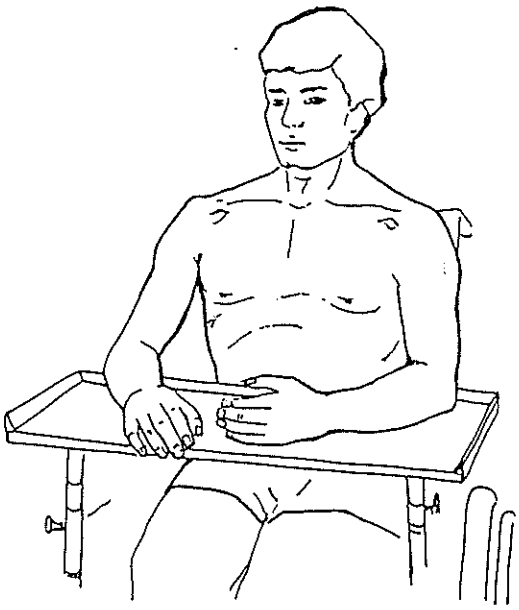
Side lying on the affected side with pillow support

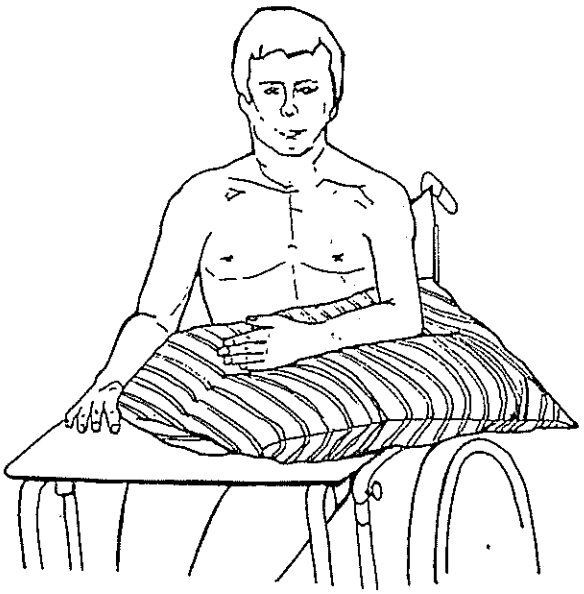
NOTE

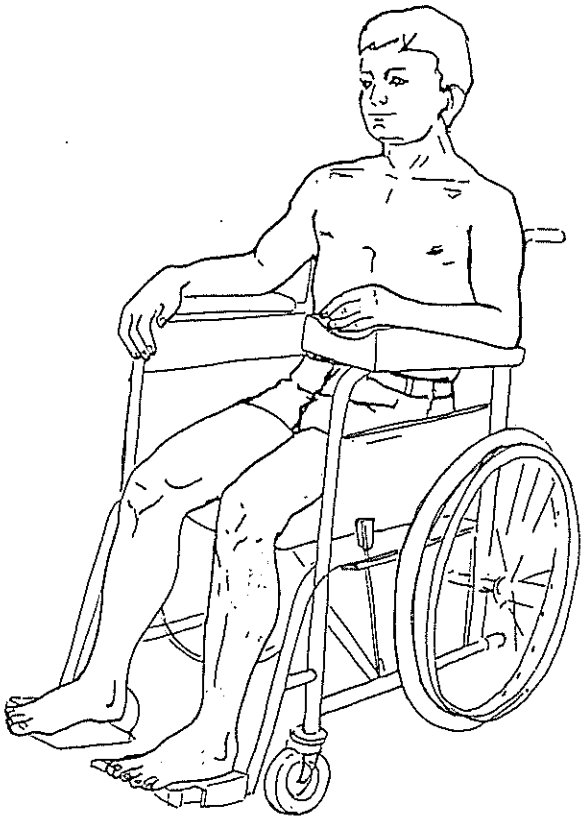
Sidelying positions are best to help avoid spasticity.

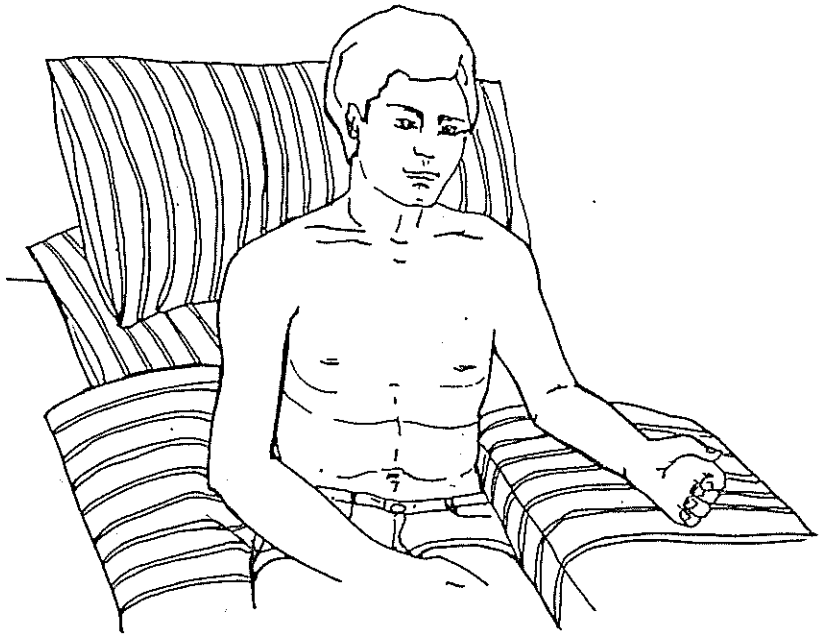
ii) suggested sitting positions

The main goal is to support the flaccid upper limb so that it does not pull on the shoulder joint and cause joint damage.









Question:

A person has left hemiplegia and has a flaccid upper limb. This limb is not supported and the patient develops problems in the left shoulder. In your own words, describe the cause of these shoulder problems.

_____

_____

_____

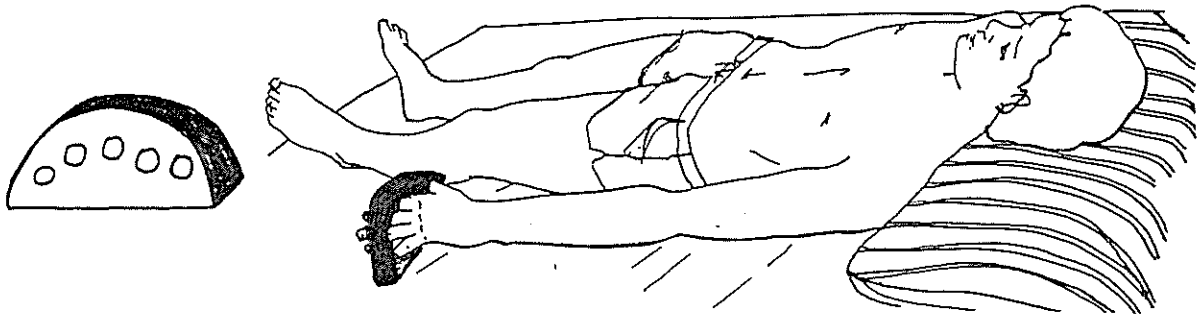
_____

iii) **equipment to help with positioning**

The different devices that can help support the joints during this period are:

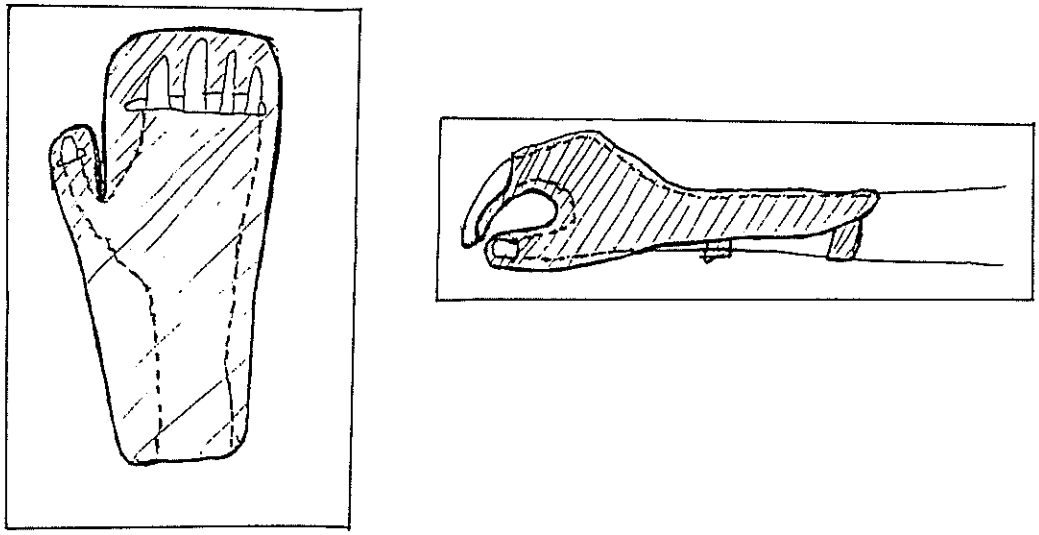
* soft finger divider
* hand splint
* shoulder supports

* soft finger divider



This divider is made of foam rubber. The patient can wear this at night to help keep the fingers apart (helps avoid spasticity).

* hand splint



This is a special splint that covers the posterior side of the hand and anterior side of distal fingers and thumb.

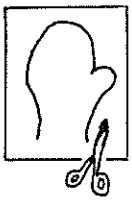
The hand is in a functional position.

The splint does not push in the palm area because pressure on this one area may increase spasticity.

Activity:

A. 

B. 

C. 

D. 

A. Take a regular size piece of paper and draw a line around the outside of the hand.

B. Cut a straight line into the paper about 5 cm from the end of the paper where the fingers and thumb were.

C. Cut around the line that you drew in step A.

D. Put fingers and thumb through the holes that you cut.

The "paper device" you have on your hand is nearly the same form as the hand splint for patients with hemiplegia.

Question:

What is the functional position for the wrist, fingers and thumb?

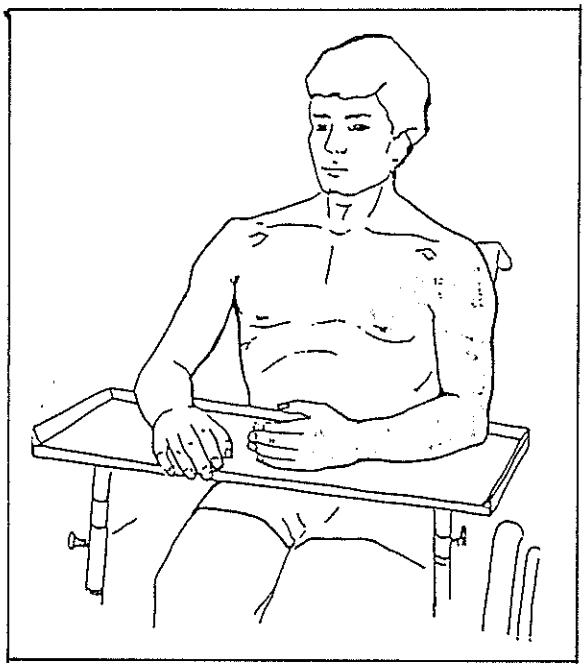
_____

_____

_____

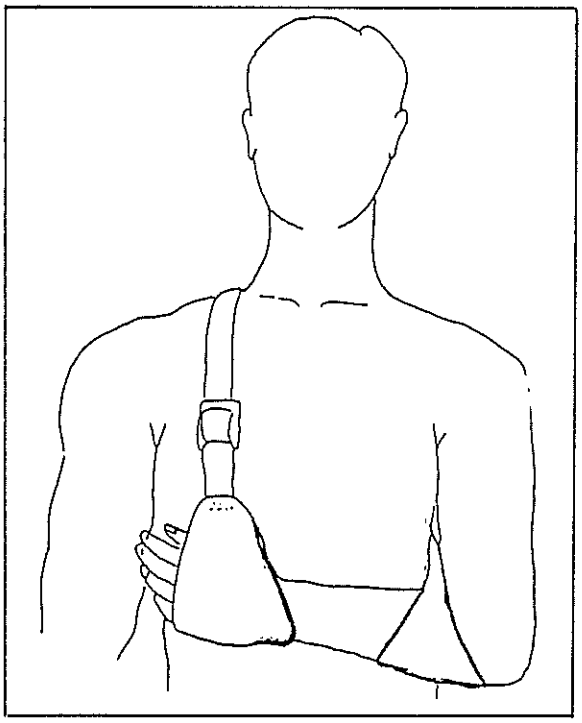
* shoulder support techniques

To help keep the humerus in a good position, the patient can rest the arm on a table in sitting position.

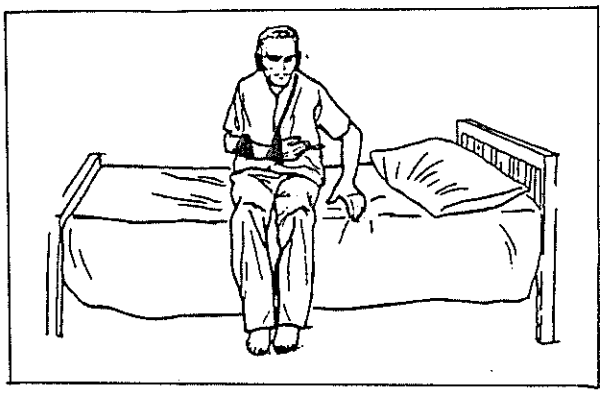


Another very good method to support the shoulder joint is an arm sling (see SLINGS chapter, Volume 2).

The recommended sling is shown below.

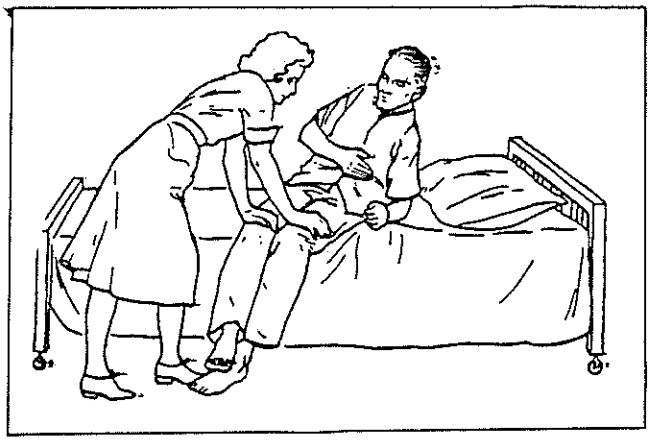


The patient should wear the sling when standing, walking, or sitting without arm support.



b. <u>oriente the patient to the hemiplegic side of the body</u>

The PTA and the patients's family must help the patient "remember" the hemiplegic side of the body and look at materials and places that are on the hemiplegic side.



Because of brain damage, one side of the body and the opposite side of the brain have no communication with each other.

As the brain recovers, communication between the brain and the body can be increased by encouraging the patient to <u>LOOK</u> at the hemiplegic side, <u>TOUCH</u> the hemiplegic side of the body, and <u>USE</u> the hemiplegic side together with the "normal" side of the body.

If the patient does not look at, touch, or try to use the hemiplegic side, communication between the brain and this side will return more slowly or sometimes not at all.

The methods used to help orient the patient to the hemiplegic side are:

* verbal instruction

* mirror

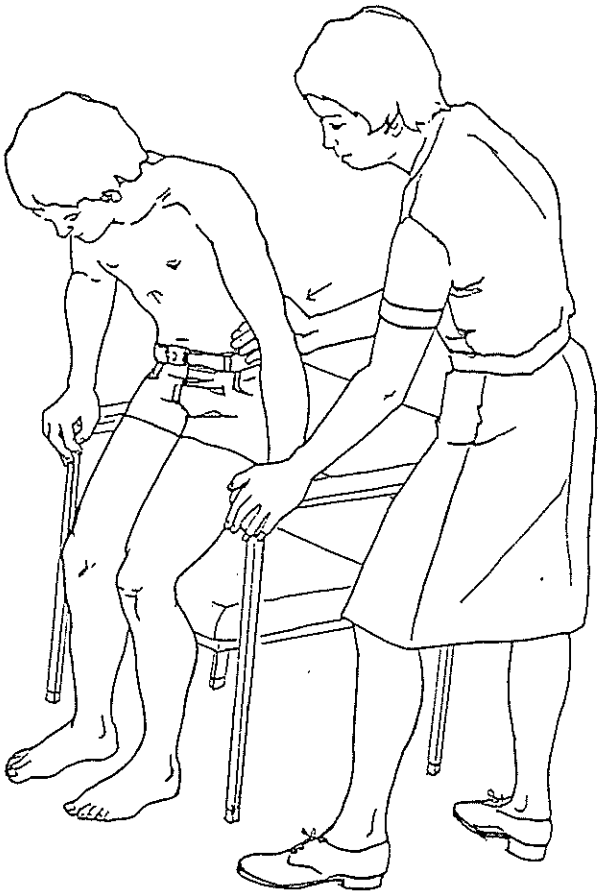
* location of materials and people

* practicing movements using the hemipelgic side

* exercises using both sides of the body

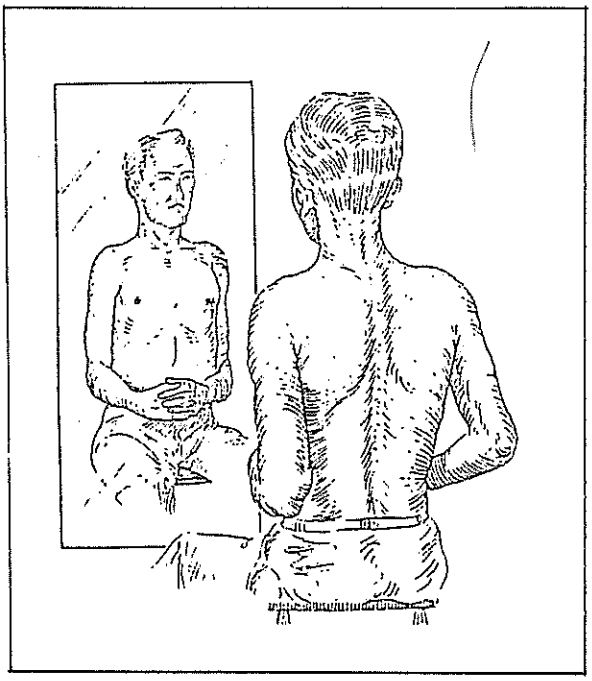
* verbal instruction

The PTA and patient's family must gently remind the patient to look at and take care of the hemiplegic side of the body.



* mirror

The PTA and family can have the patient use a mirror to help identify and correct differences between the hemiplegic and non hemiplegic side of the body.



CAUTION

Some patients can become emotional or cry when they see themselves in the mirror.

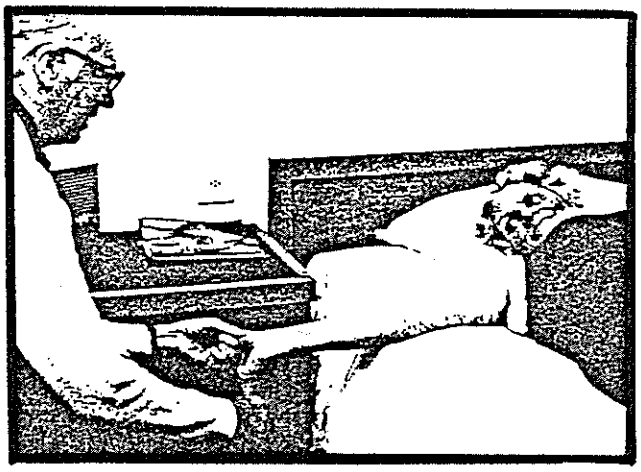
The PTA must respond to the patient's behavior by better explanation of how the mirror helps the patient correct himself, encouraging the patient by identifying positive areas, or sometimes removing the mirror.

* location of materials and people

As much as possible, materials and people should be in front of the patient and on the hemiplegic side.

If all objects were on the hemiplegic side, the patient may feel frustrated and alone.

Some objects may be in front of the patient while many should be on the hemiplegic side.



Question:

A patient has right hemiplegia. The family puts all of the objects he needs on the left side of his body. When they speak to him, they always stand on his left side.

You are a PTA that works with this patient. Would you recommend something different to the family?

Yes ____ No ___

Explain your answer.

_____

_____

_____

* practicing movements using the hemiplegic side

During the flaccid stage, the PTA or family can help "guide" the hemiplegic limbs in making functional movements.

The patient must experience different feelings and movements with the hemiplegic side of the body.

In this way, information from the hemiplegic side is available for the brain to "relearn".

The PTA's or family member's hand is on the outside of the patient's hand. In this way, the patient has direct contact with different objects.

Examples of guiding the hemiplegic limb are given below.

c. <u>psychological support</u>

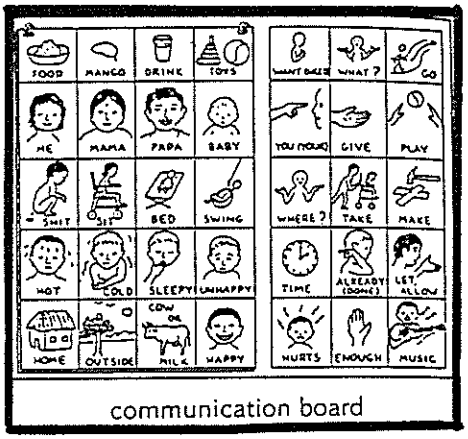
Patients with hemiplegia may have a difficult time to control their emotions.

They may laugh or cry without reason. They may be depressed or easily confused.

Psychological support is especially important for patients with right hemiplegia.

Most often, these patients know they have a problem with their body and are unable to say what they feel or need.

A simple communication board may help patients with right hemiplegia (no speech) tell others what they want.



communication board

d. maintain range of motion (ROM)

The PTA can passively move the paralyzed arm and leg. (See RANGE OF MOTION chapter, Volume 2).

Remember: Move the limb through normal range of motion only. Too much movement will increase joint problems.

Questions:

1. Why is passive ROM needed for the flaccid side of a patient with hemiplegia?

_____

_____

2. A patient has right hemiplegia. The PTA makes passive ROM for the left side and right side of the body. Do you agree with this treatment?

Yes ____ No ___

Explain your answer.

_____

_____

The patient must also learn to make self-ROM for the upper limb.

The patient will hold the hands together and then use the "good" arm to help move the flaccid arm.

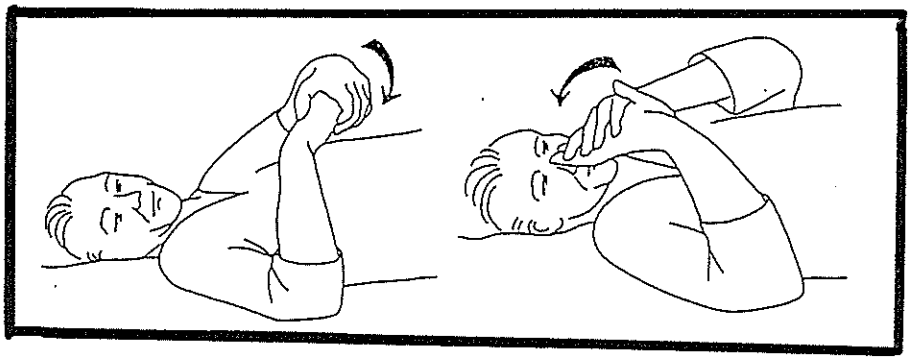
Methods to hold the hands together:

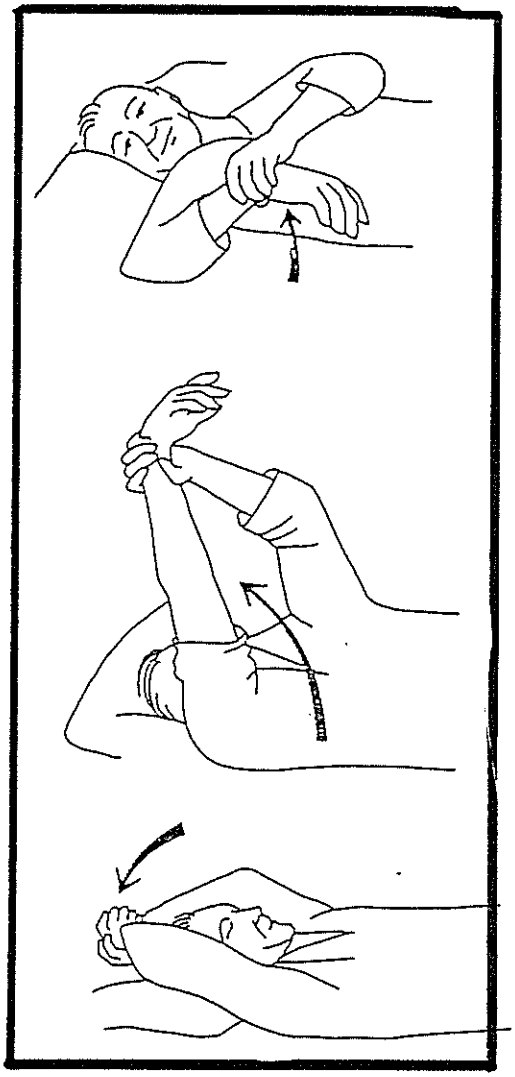
a. all fingers crossed over each other as much as possible. "Hemiplegic thumb" is on the outside.

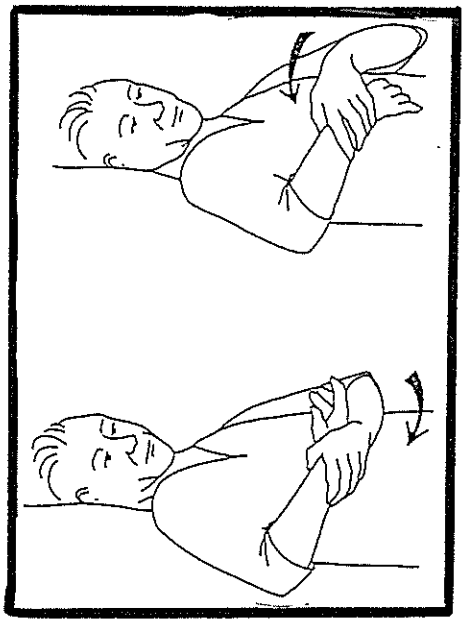
(OR)

b. all fingers crossed over each other as much as possible. "Good thumb" is on the outside.

Techniques for the patient to make self-ROM for the upper limb.







e. practice functional movements

We have said that the patient with hemiplegia should use the hemiplegic side as much as possible. This is true.

The patient with hemiplegia should also be independent in functional activities as quickly as possible.

To be independent in activities often means using the "good" side of the body.

It will be the work of the PTA to help the patient be independent and help the patient practice using the hemiplegic side whenever possible.

Example:

- The PTA will teach the patient how to move from lying to sitting position most easily (normally this is using the "good" side).

- The PTA will also help the patient practise using the hemiplegic side.

Functional movements include:

i) rolling

ii) lying ----> sitting
sitting ----> lying

iii) sitting ----> standing
standing ----> sitting

iv) transfers (bed ----> chair
chair ----> bed)

i) rolling

The patient should practice rolling to both sides of the body.

<u>rolling towards the good side</u>

STEP 1 : Hold hemiplegic arm with the good hand and bring the arm across the body.

(DEMONSTRATION)

STEP 2 : Put the good foot under the hemiplegic foot and move both legs near the side of the bed.

(DEMONSTRATION)

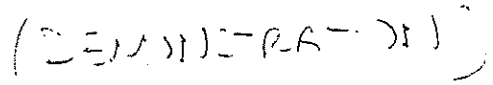
STEP 3 : Patient looks toward the good side and extends both arms toward the good side. This will help the body roll toward the good side.

(DEMONSTRATION)

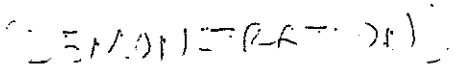
rolling towards the hemiplegic side

STEP 1 : Patient must move the hemiplegic arm so that is is in abduction.

STEP 2 : The patient bends the good knee so that the good foot is flat on the bed.



STEP 3 : The patient pushes into the bed with the good foot (this will bring the good hip forward) and reaches toward the hemiplegic side with the good arm. This will help the body roll toward the hemiplegic side.



ii) lying -----> sitting and sitting -----> lying

In the beginning, the patient may find it easiest to go from lying -----> sitting from the good side. The patient should practise lying to sitting from both sides to find the method that helps him to be the most independent.

<u>lying -----> sitting from the good side</u>

STEP 1 : Roll toward the good side (see previous section).

STEP 2 : Put the good foot under the hemiplegic foot and move both legs off the side of the bed.

(DEMONSTRATION)

STEP 3 : Bring the good arm above your head and push down with the elbow to help lift the trunk off the bed.

(DEMONSTRATION)

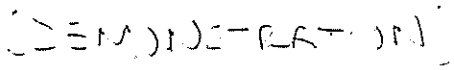
STEP 4 : Extend the elbow and slowly push yourself up to a sitting position.

(DEMONSTRATION)

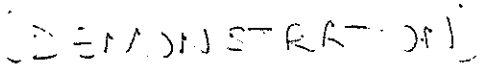
lying ----> sitting from the hemiplegic side

STEP 1 : Roll toward the hemiplegic side (see previous section).

STEP 2 : Put the good foot under the hemiplegic foot and move both legs off the side of the bed.



STEP 3 : Put good hand on the bed in front of the body and lean body weight forward and push down on this arm. This will help lift the trunk off the bed.



STEP 4 : Reposition arm to continue to help push the body to a sitting position.

Sitting ----> lying is just the opposite movement.

iii) sitting ----> standing and standing ----> sitting

The main rules that the PTA must remember are:

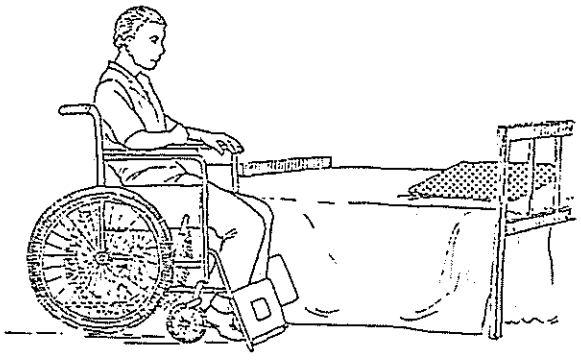
- do not pull on the hemiplegic arm

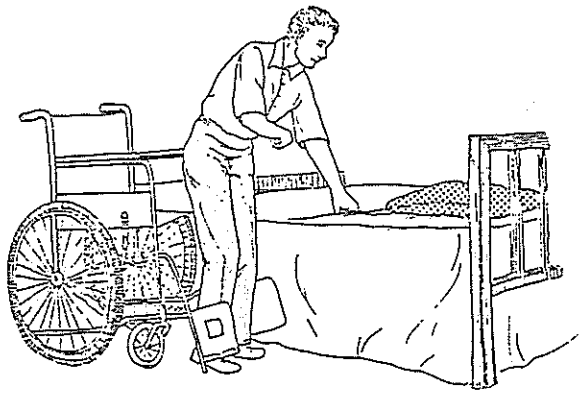
- support the hemiplegic knee to prevent flexion or hyper-extension.

For details on how to help a patient stand, see STANDING CHAPTER, Volume 2.

iv) transfers (bed ----> chair and chair ---> bed

For the most independence in the shortest time, the patient should TRANSFER TOWARD THE GOOD SIDE.



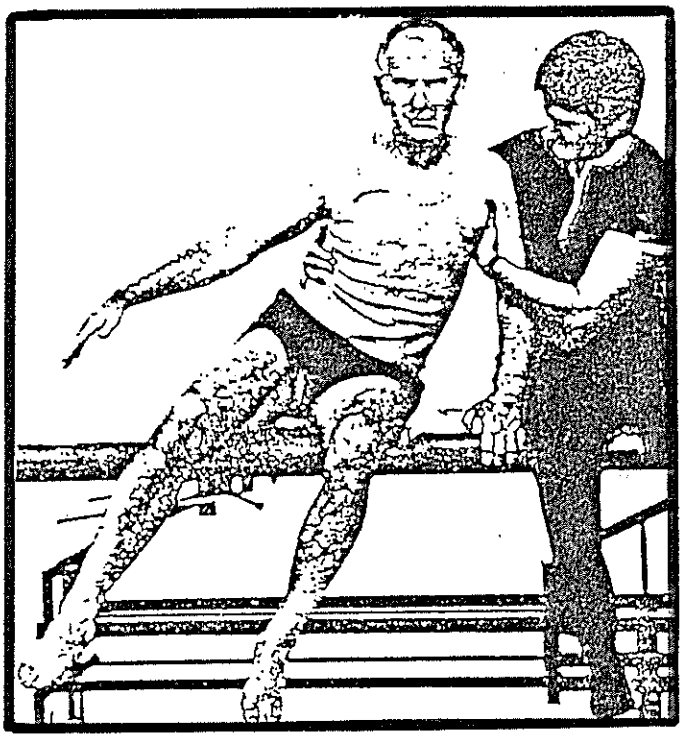


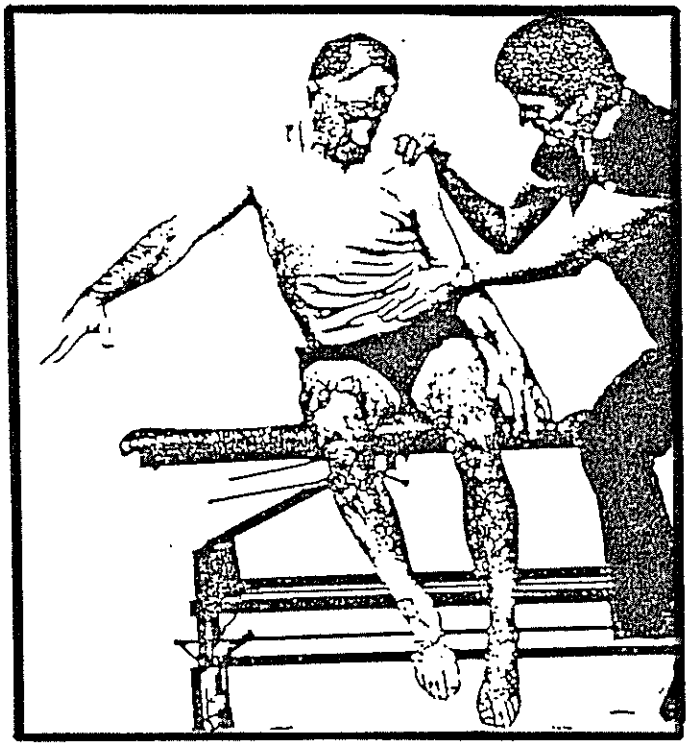
f. balance exercises

Balance exercises in sitting are very good to :

- help the patient increase trunk control on the hemiplegic side
- help the patient to again use both sides of the body together

Examples of different balance exercises are seen in the pictures below.

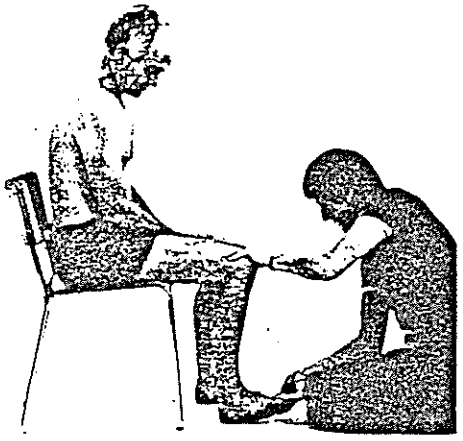




g) <u>stimulate movements not expected in group spasticity</u>

The PTA should encourage the patient to <u>relearn</u> how to move the following muscles

- elbow extensor
- wrist/finger extensors
- ankle dorsiflexor



h) provide wheelchair

Patients in flaccid satage of hemiplegia have poor balance and are not able to control the trunk or lower limb.

For these reasons, it is best to have the hemiplegic patient use a wheelchair.

It is helpful if the patient is able to use his good foot to help move the wheelchair.

2. PHYSICAL THERAPY TREATMENT IN SPASTIC STAGE

Note: It is important to remember that not all body parts will be in the same stage at the same time.

(Example - a patient's upper limb may be spastic while the lower limb continues to be flaccid).

The PTA must select activities that are best suited for the individual patient.

Physical Therapy treatment for spastic stage includes:

a. good patient positioning

b. orient the patient to the hemiplegic side of the body

c. psychological support

d. maintain range of motion

e. practice functional movements

f. work on movements independent of "group" spasticity

g. decrease spasticity

h. weight bearing on hemiplegic side

i. preparation for walking

j. independence in eating and dressing

a. good patient positioning

Follow guidelines as given in flaccid stages. Two modifications may be needed:

- If hand splint appears to increase spasticity, the PTA can try to shape it so the fingers are more extended or the splint may be removed.
- If the shoulder muscles have strong spasticity, this may be enough to hold the humerus in a good position. In this case, the arm sling could be removed,

b) orient the patient to the hemiplegic side of the body

Follow guidelines as given in flaccid stage.

Question:

Why is it important to orient the patient to the hemiplegic side of the body as early and as much as possible?

_____

_____

_____

_____

c. psychological support

Follow guidelines as given in flaccid stage.

In addition, the PTA must explain the cause of this uncontrolled movement. The patient and family will be happy to see the movements return, and must be informed not to encourage these movements, but try to encourge movements that have not yet appeared.

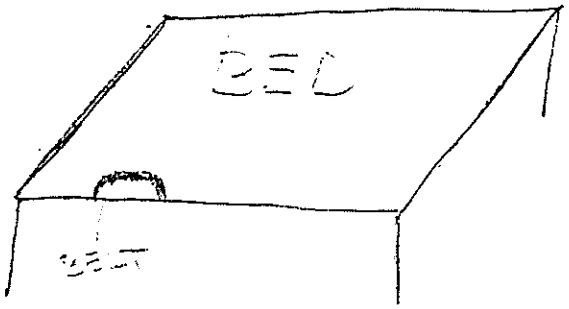
d. maintain range of motion

Follow guideline as given in flaccid stage. The patient and patient's family should be responsible to make ROM.

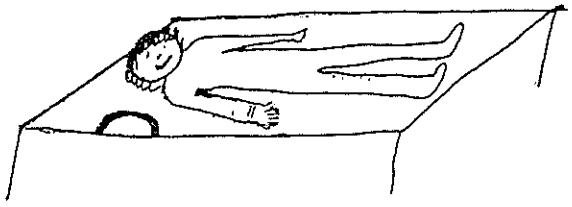
Modifications in this stage may include:

- active/assistive ROM for movements not in "group spasticity"
- passive ROM for movements included in "group spasticity"
- self-STRETCHING exercise for the hemiplegic upper limb.

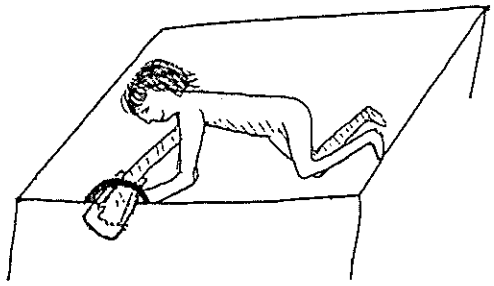
STEP 1 : A belt is attached on the hemiplegic side of the bed - near the head of the bed.



STEP 2 : Patient is wearing a hand splint (page 31-32) and lying supine on the bed.

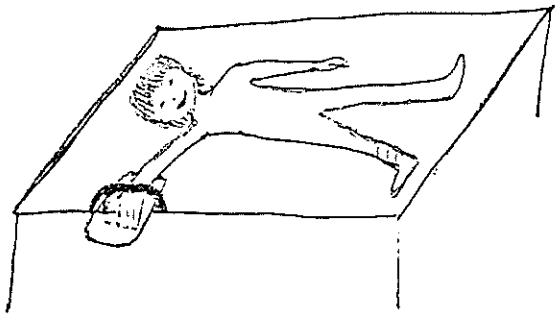


STEP 3 : Patient rolls to sidelying and puts the hemiplegic hand through the belt (forearm is supinated).



STEP 4 : With the arm inside the belt, the patient slowly rolls to a supine position. This movement will put the upper limb in a position of:

- should abduction, and external rotation
- elbow extension
- forearm supination
- hand functional position



The patient can remain in this position for 10-30 minutes, 2-3 times each day.

e. practice functional movements

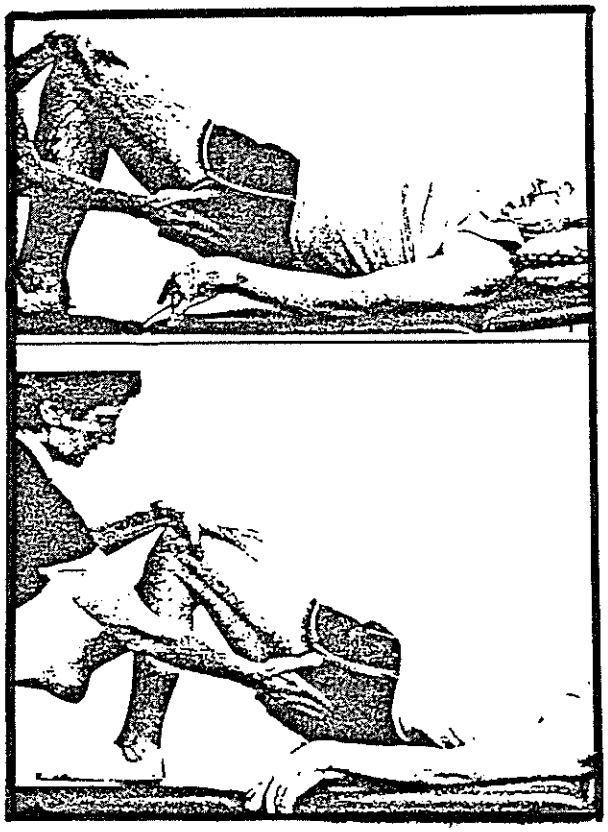
Follow guidelines as given in flaccid stage encouraging more use of the hemiplegic side, and encouraging as much independence in these activities as possible.

f. work on active movements independent of group spasticity

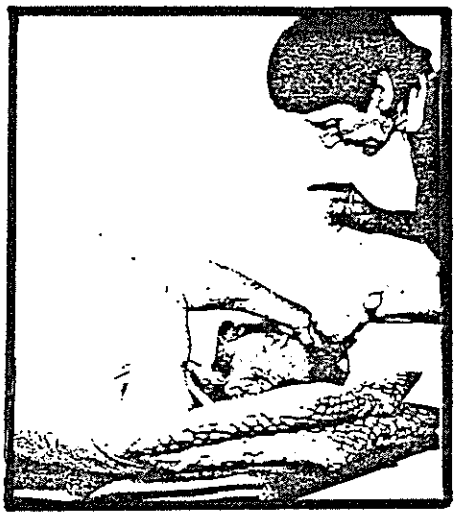
The patient must learn to control the movements on the hemiplegic side.

Examples are:

* hip extension with knee flexion



* elbow extension with shoulder flexion



g. decrease spasticity

Spasticity is the increased and uncontrolled movement of the hemiplegic side.

Most hemiplegic patients will have some spasticity.

The PTA should know that some activities may increase spasticity. These are:

- ROM or stretching that is much too fast
- stress, loud noises
- an activity that is very difficult for the good side

If the patient begins to show spasticity, the PTA can first try to modify the above activities.

Spasticity can also be decreased by breaking "group spasticity". Ways to do this are:

i) specific joint positions

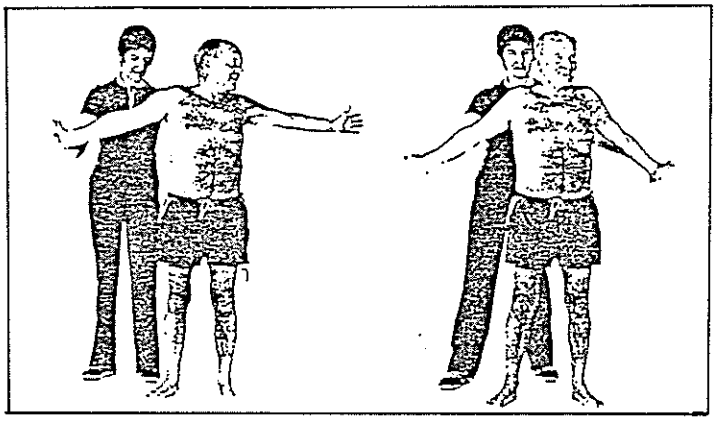
ii) trunk rotation

iii) SLOW muscle stretching

i) specific joint positions

Upper limb position that may help decrease spasticity:

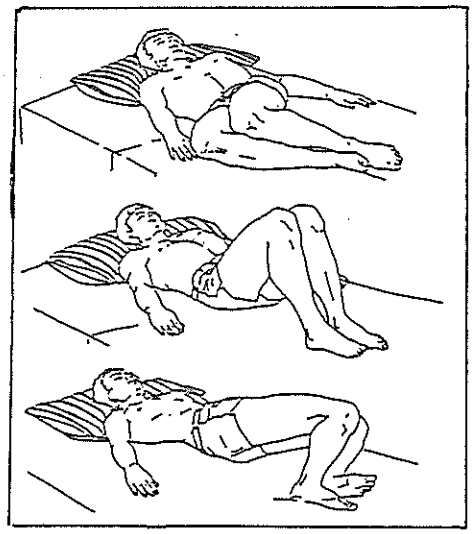
shoulder	- external rotation, ABDuction
elbow	- extension
forearm	- supination
wrist	- extension
fingers	- extension
thumb	- abduction and extension



Lower limb position will depend on the specific patient. The PTA must work with the patient to help identify what positions best decrease the patient's spasticity.

ii) trunk rotation

Moving the hips in one direction and the shoulders in another direction will help to decrease the spasticity in the body.



Trunk rotation exercises are very good for the patient and should be practiced every day.

Rotation helps the body work together, prevents stiffness in the trunk and helps decrease spasticity.

iii) SLOW muscle stretching

A muscle stretch must be slow and constant.

> **WARNING**
>
> A HARD AND FAST STRETCH WILL INCREASE SPASTICITY

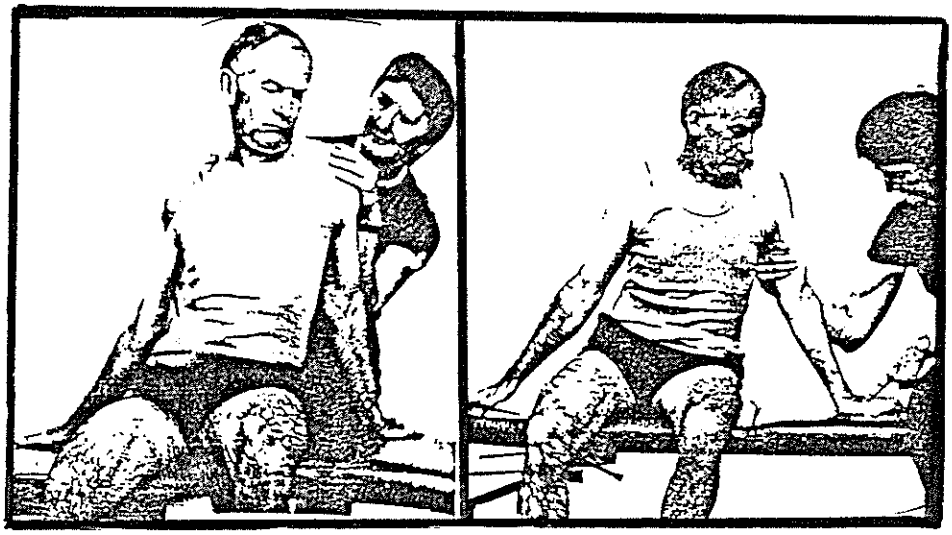
SLOW rotational movements at the proximal joints (shoulder/hip) may help decrease spasticity for the limb.

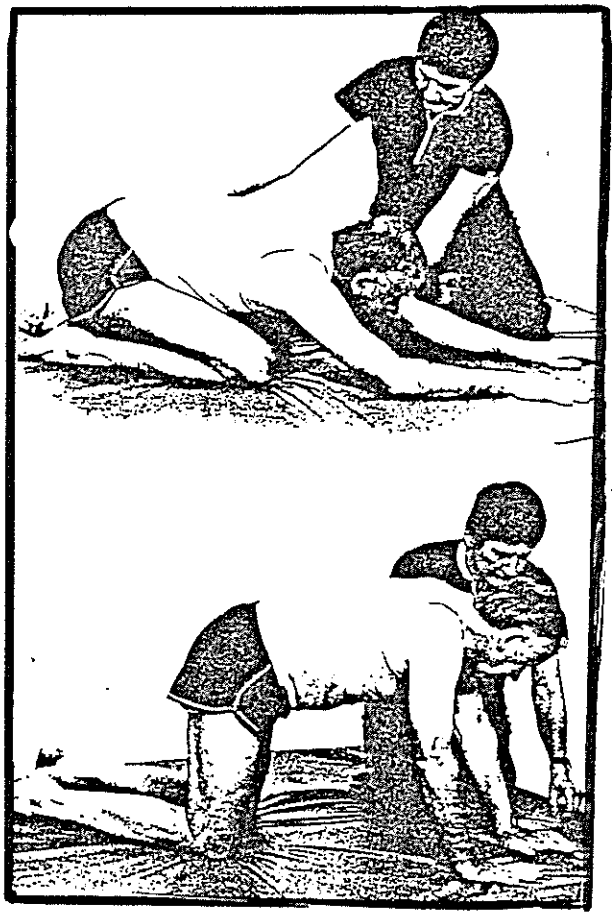
When working with the arm, try to place the leg in an anti-spastic position.

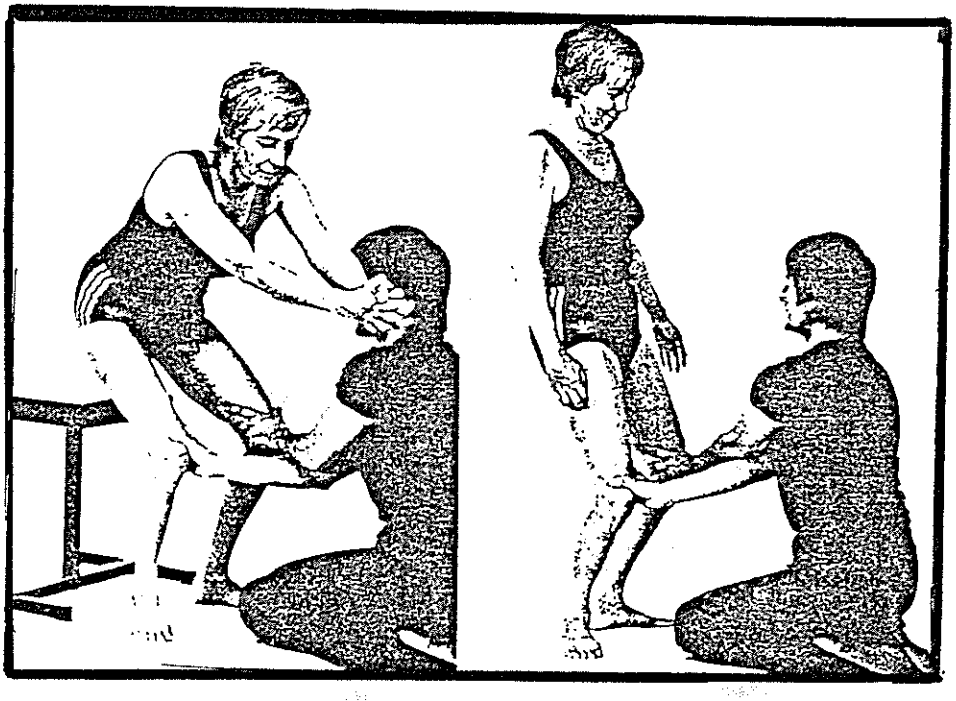
h. weight bearing on the hemiplegic side

Putting weight through a hemiplegic limb gives the joints more information to help them relearn these positions.

Examples of weight bearing on the hemiplegic side are seen in the pictures below.



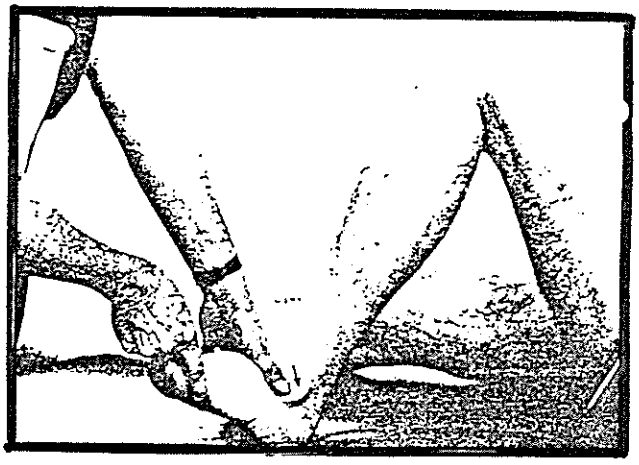


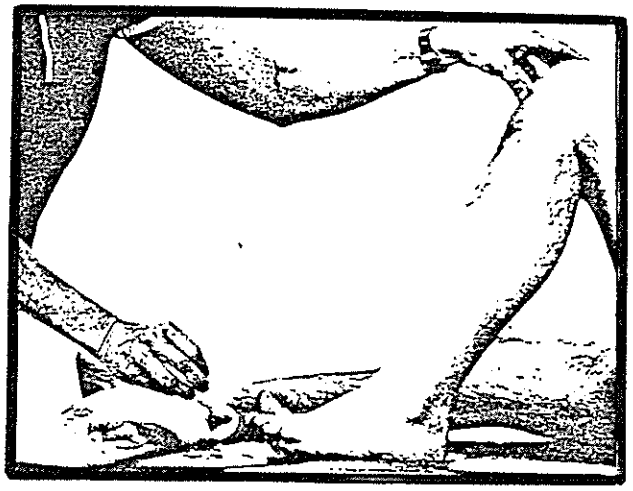


i) preparation for walking

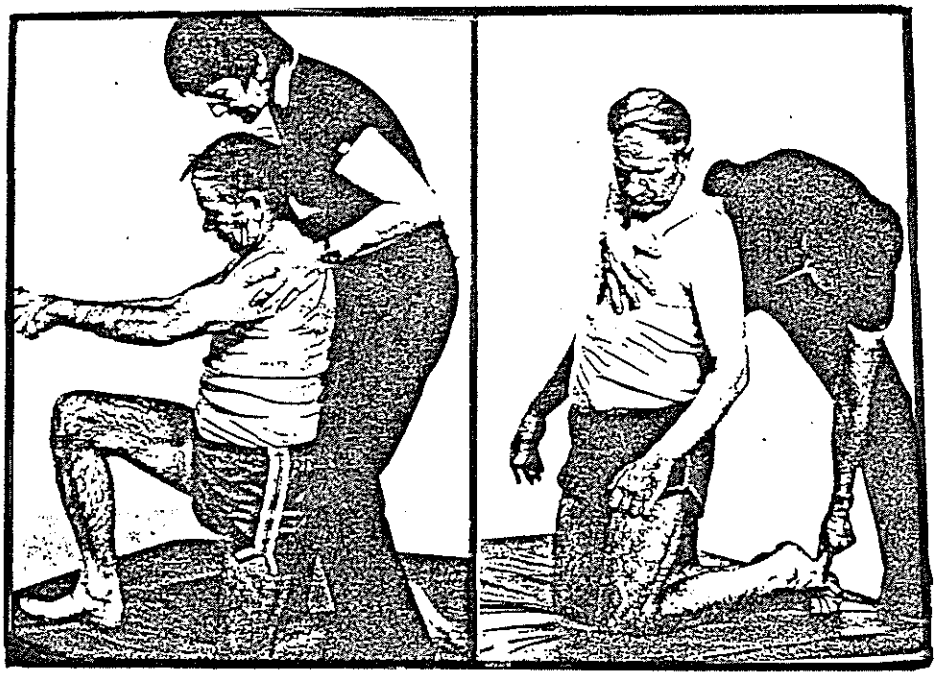
The PTA and patient can work together to help regain control of the lower limbs and trunk by doing the following activities.

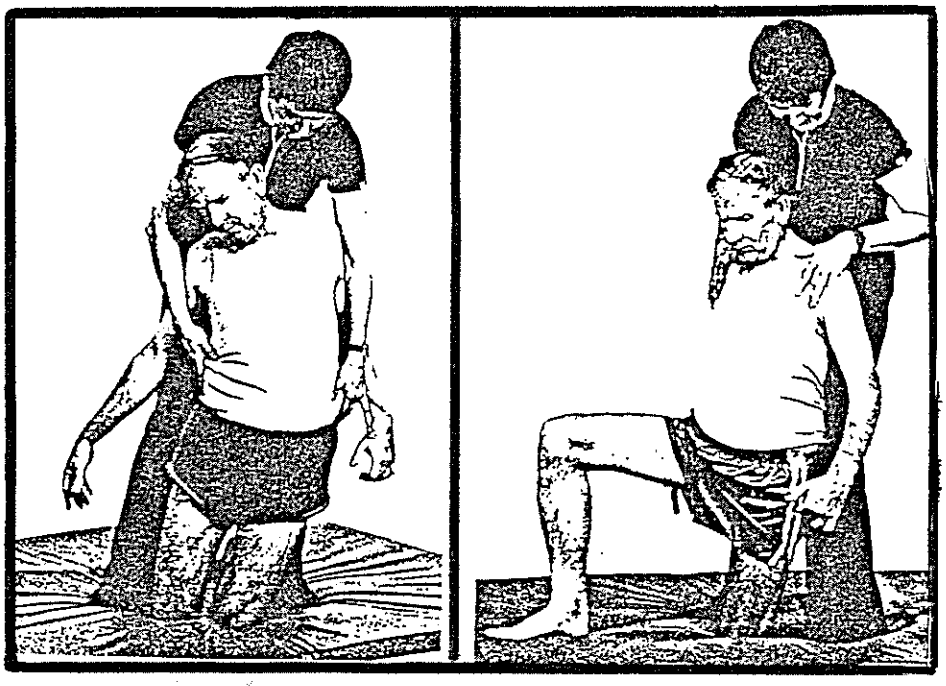
IN LYING POSITION



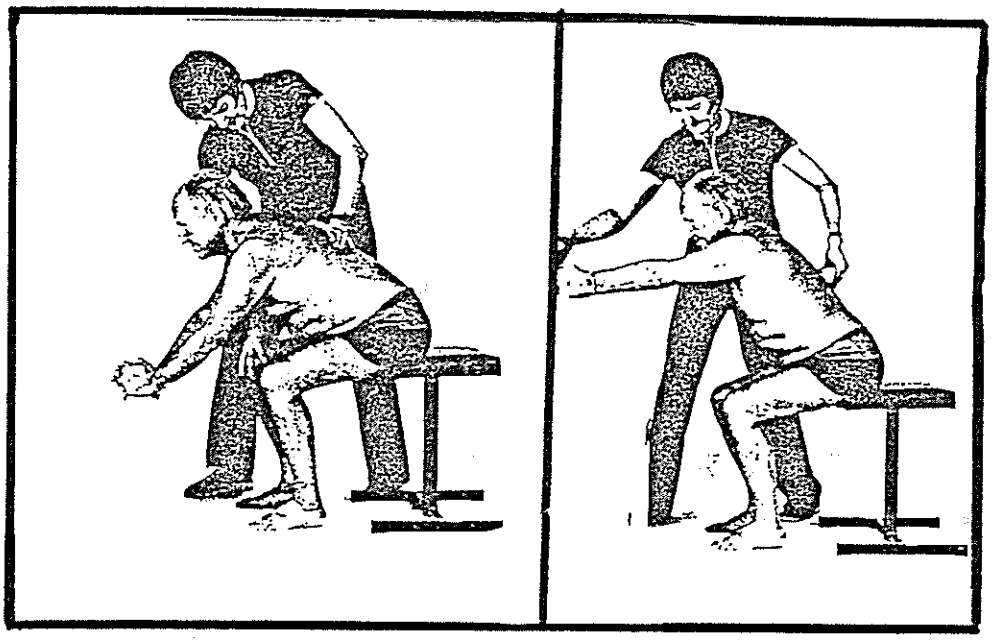


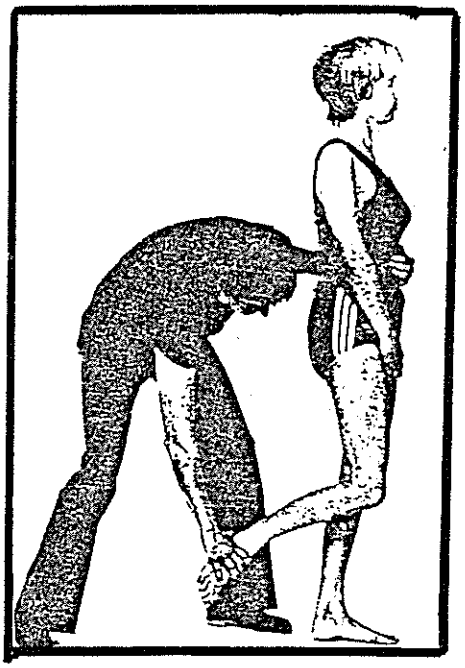
IN KNEELING POSITION



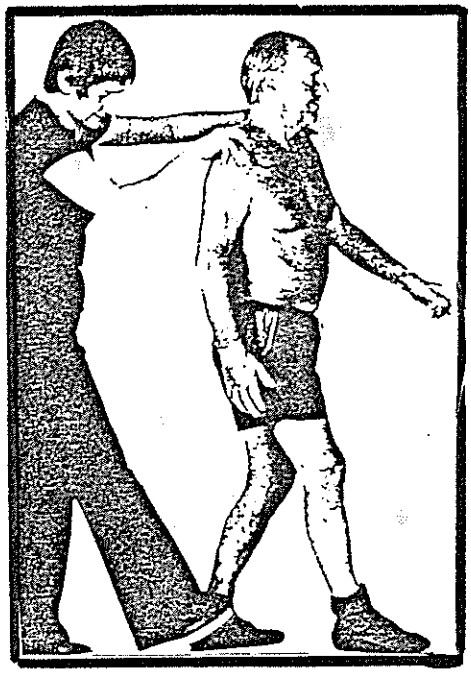


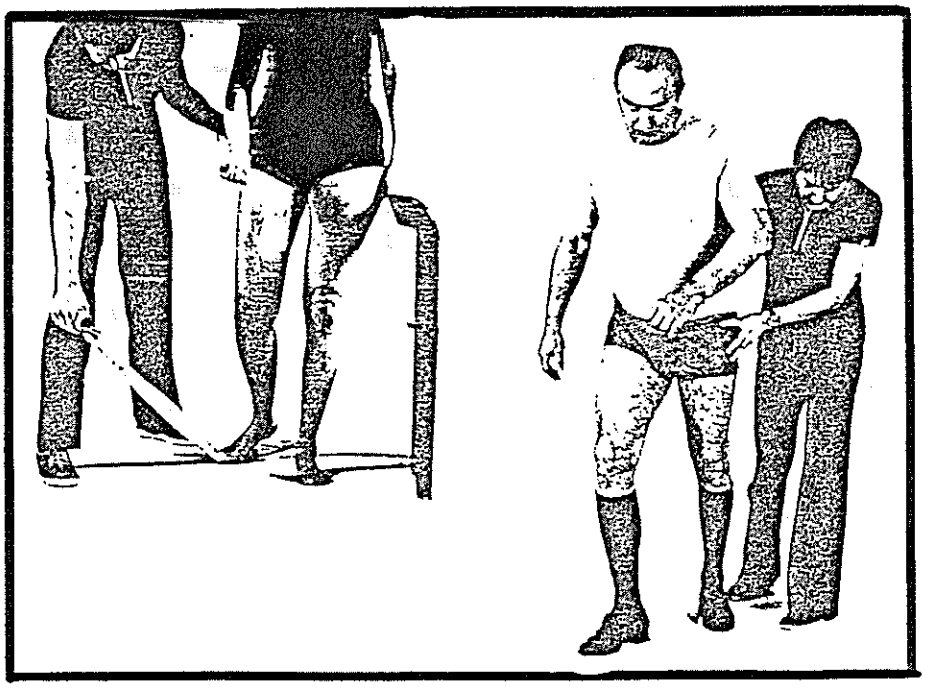
IN STANDING POSITION





IN STANDING POSITION

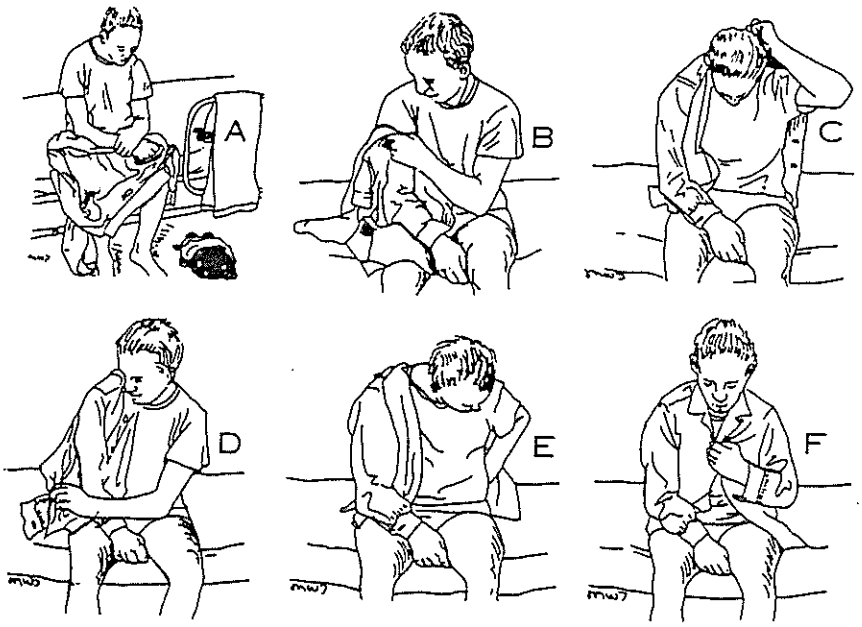




Please see GAIT TRAINING for other pre-gait activities.

j. independence in eating and dressing

When the patient puts clothes on, he should always dress the hemiplegic side first.



Many patients may eat with the "good" side. These patients can help to keep plates from moving by using the hemiplegic arm to hold them.

For more details see DEVICES FOR AUTONOMY chapter, Volume 2.

E. PHYSICAL THERAPY TREATMENT IN RECOVERY STAGE

Note: It is important to remember that not all body parts will be in the same stage at the same time.

(Example - a patient may begin to have some controlled movement in the hip, but his ankle continues to be spastic).

The PTA must select activities that are best suited for the individual patient.

Physical Therapy treatment for recovery stage includes:

a. continue all appropriate activities from flaccid and spastic stages

b. walking activities

c. equipment needs

d. house adaptations

e. community integration

a. continuing all appropriate activities from flaccid and spastic stages

The PTA must regularly evaluate the patient and select treatments that will help the patient improve in different areas.

b. walking activities

After the patient has good standing balance and some control of the hemiplegic lower limb, he can begin more complete walking activities.

In spastic stage the patient worked on many gait preparation activities.

The PTA should give special care to the following areas.

- heel contacts the ground first (hemiplegic side)
- good weight shifting to hemiplegic side
- hemiplegic knee does <u>not</u> hyperextend during stance phase
- the patient's trunk remains straight
- prevent too much group spasticity in the upper limb.

Below are picture that show how to help the patient in some of these areas.

c. equipment needs

The PTA must identify if any equipment is needed to help improve the function of the patient.

Some patients may need wheelchairs, others may need a walking aid (see WALKING AIDS chapter, Volume 2), others may need a leg brace (see BRACES chapter, Volume 2), and others may need NO EQUIPMENT.

d. house adaptations

When the patient returns home, the house may need some changes to help the patient move more independently.

Hand rails on the inside and outside of the house may be very useful for some patients with hemiplegia.

For more details, see HOUSE ADAPTATIONS chapter, Volume 2.

e. community integration

Questions:

1. Explain what community integration means.

_____

_____

_____

_____

2. How can the PTA work together with the patient and family to help integrate a hemiplegic patient into the community?

_____

_____

_____

H. CHAPTER SUMMARY

Hemiplegia is uncontrolled movement and decreased feeling in one side of the body.

Hemiplegia is caused from damage to one side of the brain. Damage on one side of the brain will cause problems on the opposite side of the body.

There are 3 stages of hemiplegia:

FLACCID STAGE	-	no movement at all on the hemiplegic side
SPASTIC STAGE	-	UNCONTROLLED, EXTRA movement of the hemiplegic side. These uncontrolled movements happen in groups (called "group spasticity").
RECOVERY STAGE	-	CONTROLLED movement. The patient is able to make some movements independent of the "group spasticity".

Note: Every hemiplegic patient is different. When, if and where these "stages" occur will depend on the individual patient.

Other problems that hemiplegic patients may have:

* "forgetting" the hemiplegic side of the body (and all the objects located on the hemiplegic side)
* speaking - patients with right hemiplegia often lose their ability to speak (but they continue to understand)
* controlling emotions - the patient may laugh or cry for very little reason

It is important to remember that in hemiplegia, the patient's problem is NO CONTROL over movements on the hemiplegic side.

Strengthening and muscle testing are NOT appropriate for hemiplegic patients.

Relearning and controlling movements are the goals of Physical Therapy.

Specific Physical Therapy evaluation and treatment suggestions are given for each of the stages in Hemiplegia.

28.

SPINAL CORD INJURIES

A SPINAL CORD INJURY
is damage to the spinal cord.

OBJECTIVES

At the time of the exam and with 80% proficiency, the student will be able to correctly:

1. compare paraplegia with tetraplegia; and complete with incomplete spinal cord injuries.

2. describe the cause of spasticity in patients with spinal cord injuries.

3. list complications that can happen with spinal cord injury patients and how Physical Therapy can help to prevent them.

4. describe Physical Therapy treatment for different levels of spinal cord injuries and different stages of recovery.

CHAPTER CONTENTS

A. INTRODUCTION

NOTE

Before beginning this chapter, this PTA should review the NEUROLOGY chapter, Volume 1, to have a better understanding of the content.

Questions:

1. What does the spinal cord do?

_____

_____

_____

2. Where is the spinal cord?

_____

_____

B. WHAT IS A SPINAL CORD INJURY?

A spinal cord injury is damage to the spinal cord.

The important things to know about a spinal cord injury are:

1. How Much the Spinal Cord is Injured.

2. Where the Spinal Cord is Injured.

1. HOW MUCH THE SPINAL CORD IS INJURED

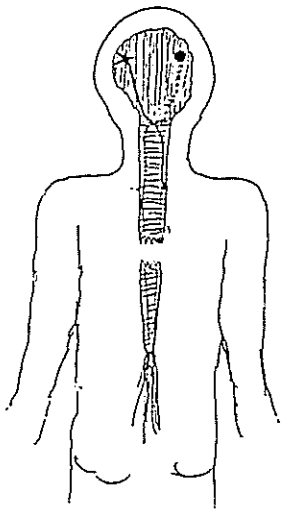
A spinal cord injury can be "complete" or "incomplete".

"complete" spinal cord injuries:

The spinal cord that has a complete injury cannot carry messages to and from the brain.

The road is completely broken.

When messages arrive at this broken area, they cannot pass at all.



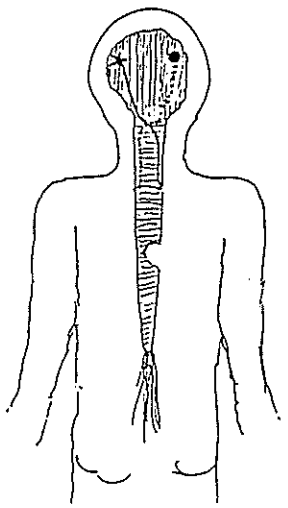
"incomplete" spinal cord injuries

The spinal cord that has an incomplete injury may still be able to carry some messages to and from the brain.

A part of the road is broken.

When messages arrive at this area, some messages are able to pass.

(How many messages and what kind of messages are carried depends on what part of the spinal cord is damaged.)



Question:

Below the complete spinal cord injury there will be no controlled muscle movement and no feeling in the skin or tissues. Please explain why.

_____

_____

_____

It is very important to remember that when the spinal cord is damaged, cut or broken it CANNOT REPAIR ITSELF.

2. WHERE THE SPINAL CORD IS INJURED

a) The spinal cord may be injured in the cervical area.

If the cervical area is injured: the arms, trunk, and legs will have a problem with movement and feeling.

The diagnosis is called TETRAPLEGIA or QUADRIPLEGIA.

b) The spinal cord may be injured in the thoracic area.

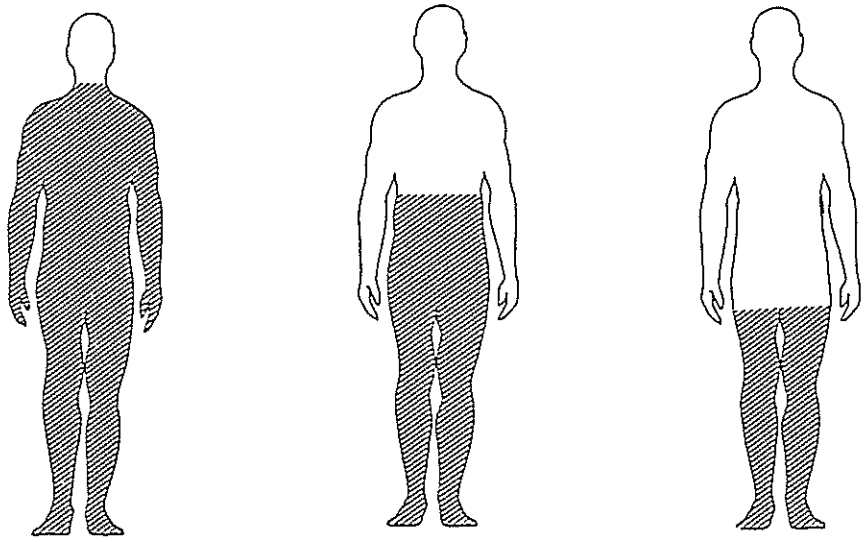
If the thoracic area is injured: the trunk and legs will have a problem with movement and feeling.

The diagnosis is called (high) PARAPLEGIA.

c) The spinal cord may be injured in the lumbar area.

If the lumbar area is injured: the legs
will have a problem with movement and feeling.

The diagnosis is called (low) PARAPLEGIA.



(a) (b) (c)

Questions:

1. Describe (in your own words) the meaning of tetraplegia and paraplegia.

2. How are tetraplegia and paraplegia similar?

Questions: (continued)

3. How are tetraplegia and paraplegia different?

_____

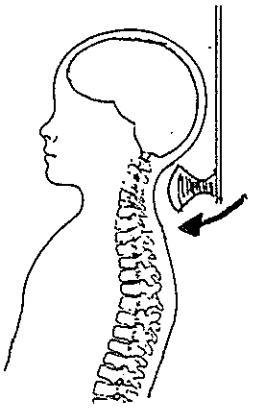
_____

_____

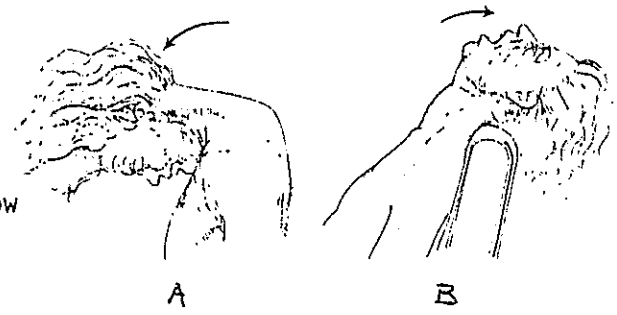
C. CAUSE OF A SPINAL CORD INJURY

The spinal cord can be injured from:

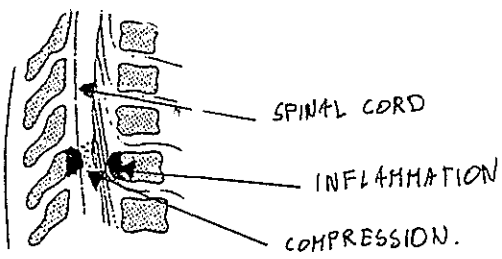
* bullet, knife, schrapnel that damage the cord directly



* abnormal movements or fractures of the vertebral bones that will damage the spinal cord (falling from a house, diving into shallow water, car accident)



* disease (TB - Pott's disease) causing inflammation and swelling which lead to compression and damage of the spinal cord



D. SPECIFIC INFORMATION ABOUT A SPINAL CORD INJURY

In this section, the following topics will be presented.

1. Identifying different levels of Spinal Cord Injuries (SCI)
2. Spasicity in patients with SCI
3. Complications of Spinal Cord Injuries
4. Stages of recovery for SCI patients

1. IDENTIFYING DIFFERENT LEVELS OF SPINAL CORD INJURIES

The level of a spinal cord injury can be identified by:

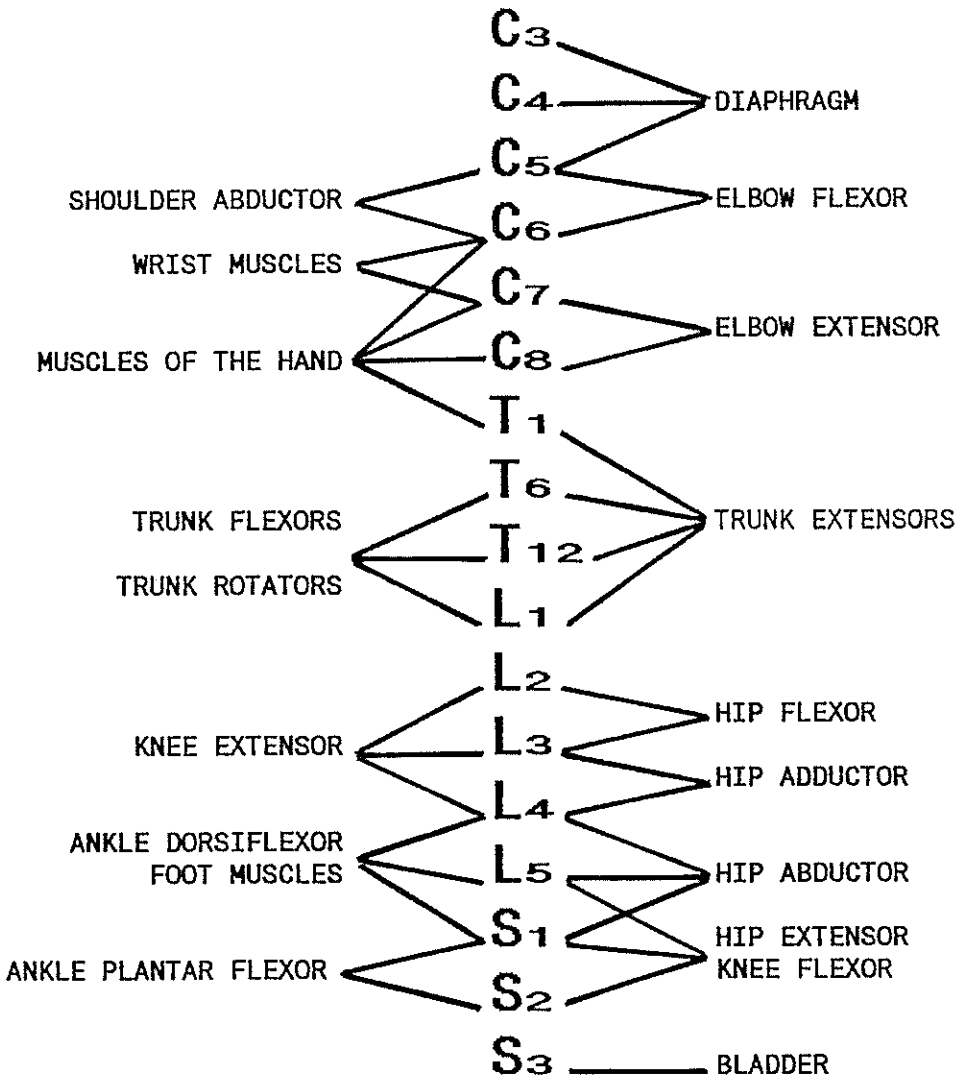
a. MUSCLE TESTING

b. SENSORY TESTING

a. MUSCLE TESTING

A motor nerve comes from the brain to tell a muscle to work (see NEUROLOGY and MYOLOGY chapters, Volume 1).

Below is a summary of different motor nerves and the muscles that they tell to work.



NOTE:

* One motor nerve can tell one or more muscles to work

* One muscle can receive messages from more than one motor nerve.

Questions:

Look at the chart on page 8 to answer the following questions.

1. L2 tells what muscles to work?

_____

2. What motor nerves tell the muscles of the hand to work?

_____

3. L5 helps to tell how many different muscles to work?

_____

4. What motor nerves tell the elbow extensor to work?

_____

5. How many different motor nerves tell the knee extensor to work?

_____

If the spinal cord is destroyed, the motor nerves below the injury cannot carry messages from the brain to the muscle.

If the muscle receives no order from a motor nerve, it will not work.

If the muscle receives only a few orders, it can work but it will be weak.

As we have said before, the level of a spinal cord injury can be identified by muscle testing (see MYOLOGY, Volume 1).

Questions:

1. What is muscle testing?

2. Explain how muscle testing can help identify the level of a spinal cord injury.

The level of the spinal cord injury is named by identifying the lowest nerve that continues to work.

Examples:

C6 complete quadriplegia = C1-C6 nerves work; C7-S3 do not work.

L3 complete paraplegia = C1-L3 nerves work; L4-S3 do not work.

L2 incomplete paraplegia = C1-L2 nerves work; L3-S3 may not work.

Questions:

To answer these questions, please see the chart on page 8.

1. A patient has C6 complete quadriplegia. One patient has C7 complete quadriplegia. Can these 2 patients move the same muscles of the elbow?

   Yes _____ No _____

   Explain your answer.

   _____

   _____

2. A patient has L2 incomplete paraplegia. Will the trunk have a problem?

   Yes _____ No _____

   Will all the muscles of the leg have a problem?

   Yes _____ No _____

   Explain your answer.

   _____

   _____

3. A patient has strong knee extensors, weak foot muscles, no hip extensors and no ankle muscles. He has a complete spinal cord injury. What level is this spinal cord injury?

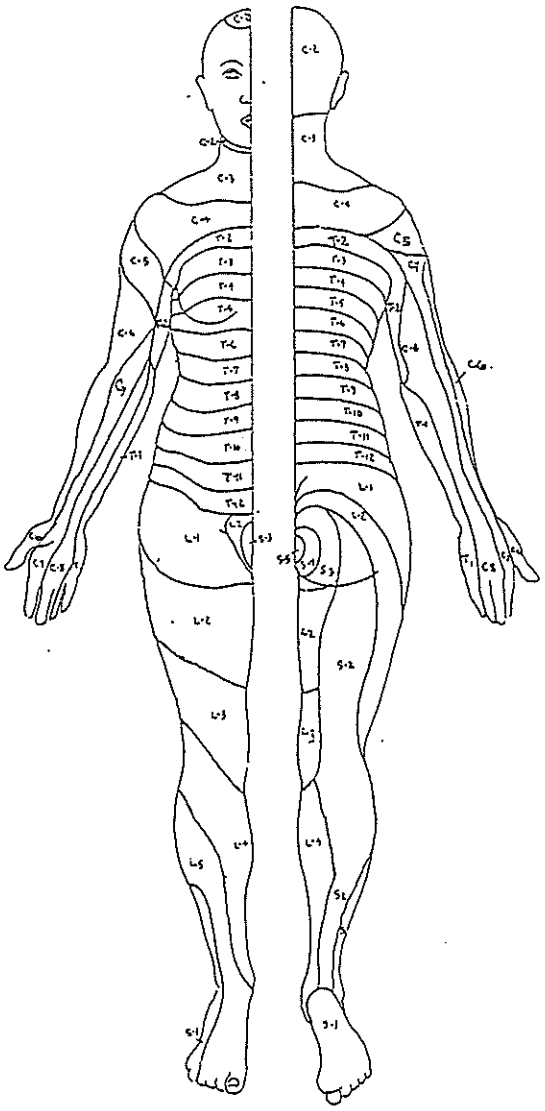
   _____

b. SENSORY TESTING

A sensory nerve comes from the skin and body to tell the brain what we feel (see NEUROLOGY chapter, Volume 1).

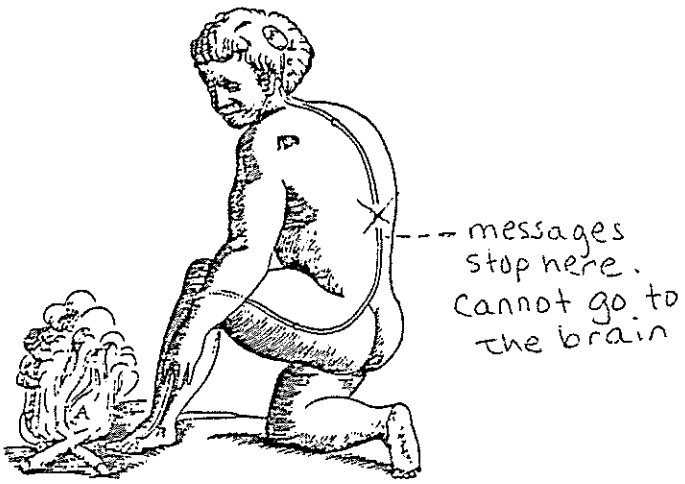
Different sensory nerves are responsible to tell the brain about different parts of the body.

The picture below gives a summary of the nerves that carry information from different skin areas.



ANTERIOR VIEW POSTERIOR VIEW

If the spinal cord is destroyed, the sensory nerves <u>below</u> the injury cannot carry messages from the skin to the brain.



If the brain receives <u>no message</u> from a sensory nerve, we will not feel that area of the body.

If the brain receives a few messages from a sensory nerve, we can have some feeling in that area, but the feeling will be decreased.

Sensory testing (see NEUROLOGY chapter, Volume 1) can help identify the level of the spinal cord injury.

More importantly, sensory testing is used to identify what body areas a patient cannot feel.

These area must be given special care so that <u>pressure sores</u> (see PRESSURE SORES chapter, Volume 3) can be prevented.

<u>Questions</u>:

To answer the following questions, please see the picture on page 12.

1. A patient has C6 complete quadriplegia. Describe the areas that this patient can feel.

_____

_____

_____

Questions: (continued)

2. A patient has C7 complete quadriplegia. Explain why this patient must check carefully for pressure sores on the lower limbs.

_____

_____

_____

3. A patient has L3 complete paraplegia. Will this patient feel pain if he has a wound on his foot?

Yes _____ No _____

Explain your answer.

_____

_____

_____

2. SPASTICITY IN PATIENTS WITH SPINAL CORD INJURIES

Question:

From the study of Neurology, please describe a REFLEX. Include how a reflex happens, where a reflex happens, and why a reflex happens.

_____

_____

_____

_____

_____

_____

_____

Spasticity is uncontrolled muscle contraction.

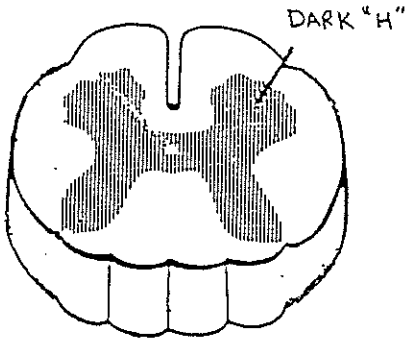
The spasticity seen in spinal cord injuries is caused by reflexes.

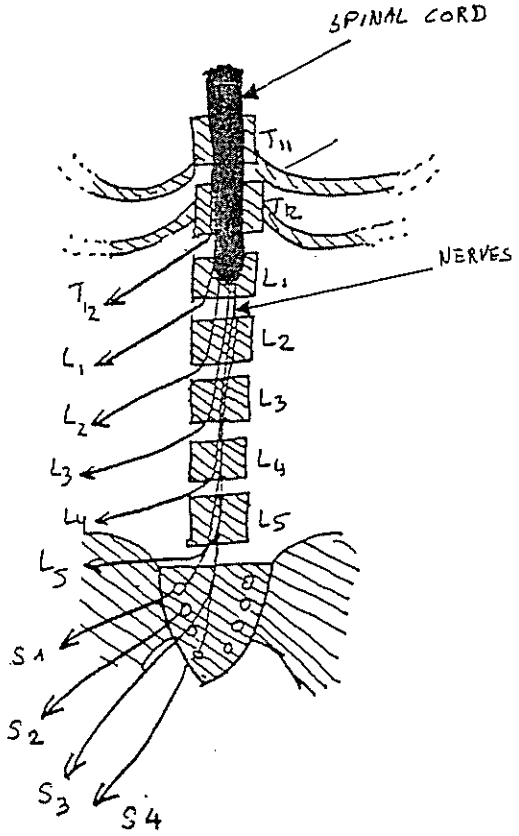
A reflex is a quick decision made in the spinal cord that always causes a muscle contraction.

After a reflex, the brain sends a message to stop this contraction or continue it.

If the spinal cord is damaged, the brain cannot control this "reflex" and the muscle contraction will continue. This is spasticity.

It is important to remember that reflexes (fast decisions) happen in the gray area of the spinal cord.





The spinal cord stops at about L1. Below this area, only anterior (motor) and posterior (sensory) nerves continue.

If there is injury at L2 or below, no reflex can happen because there is no connection to the gray area of the spinal cord.

This means there should be no spasticity in spinal cord injuries below L1.

Complete spinal cord injuries below L1 will result in flaccid muscles and no sensation below that level.

Question:

Explain why a quick joint movement (quick muscle stretch) will increase spasticity.

_____

_____

_____

A long constant stretch will decrease spasticity.

3. COMPLICATIONS THAT CAN HAPPEN AFTER A SPINAL CORD INJURY

Four main problems that can happen after a spinal cord injury are:

a. pressure sores (bed sores)

b. contractures/joint tightness

c. urinary infections/constipation

d. respiratory problems

a. Pressure sores (see PRESSURE SORES chapter, Volume 3)

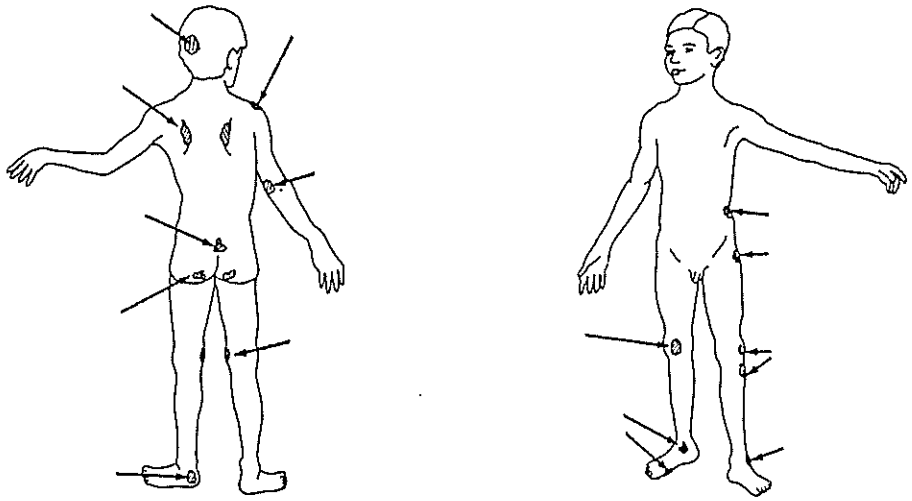
When there is pressure on a skin area for a long time, blood cannot arrive.

If blood cannot arrive, the skin will die. The areas where the skin is weak or dead can easily become infected.

Spinal cord injury (SCI) patients may be unable to move themselves, and they cannot feel when an area begins to have pain from too much pressure.

Spinal cord injury patients (and all patients that cannot move) are at high risk to get bed sores.

Areas that are likely to develop bed sores are shown in the pictures. (right)



b. <u>contractures/joint tightness</u>

If the patient is unable to move the limbs, and no one helps to make range of motion (ROM), joint movement will become limited.

Joint movement can be limited because of two reasons:

1. parts of the <u>joint</u> will become stiff and tight.

2. <u>muscles</u> are not moved and they will become tight in the position that they are in.

<u>Questions</u>:

1. Please name two parts of the joint that can become tight or stiff if there is no ROM given.

_____

_____

Questions: (continued)

2. A PTA gives massage for a patient who has limited ROM. The PTA gives no other treatment. Is this a good treatment plan?

   Yes _____ No _____

   Explain your answer.

_____

_____

_____

_____

3. A patient cannot move her legs. When she is in bed, her ankles are always in plantar flexion. What muscles may become shortened because of this position?

_____

   What movement may be limited?

_____

4. A patient is a C7 complete quadriplegic. He has been in bed for 10 months with no ROM. His position is always hip flexion and knee flexion. What muscles have become shortened?

_____

   What movements may be limited?

_____

_____

SPECIAL NOTE:

For some tetraplegic patients, tightness in the wrist and finger flexors can be useful! (See pages 34-36)

c. urinary infections/constipation

Normally, our body can remove wastes (urine and stool) with little or no problem.

A summary of how these wastes are removed is given below:

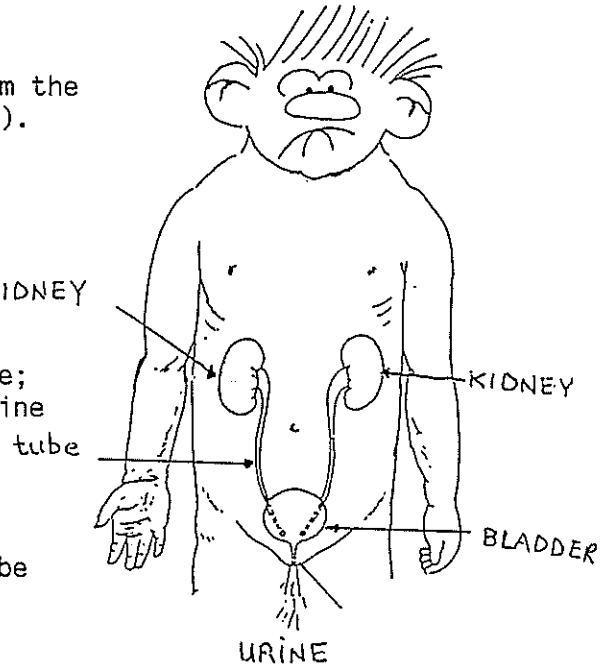
URINE REMOVAL

The kidneys take waste from the blood producing urine (pee).

Small tubes carry urine to the bladder.

The bladder is a bag that stretches to hold the urine; the bladder empties the urine when it is full.

The urine passes from the bladder through another tube and then leaves the body.

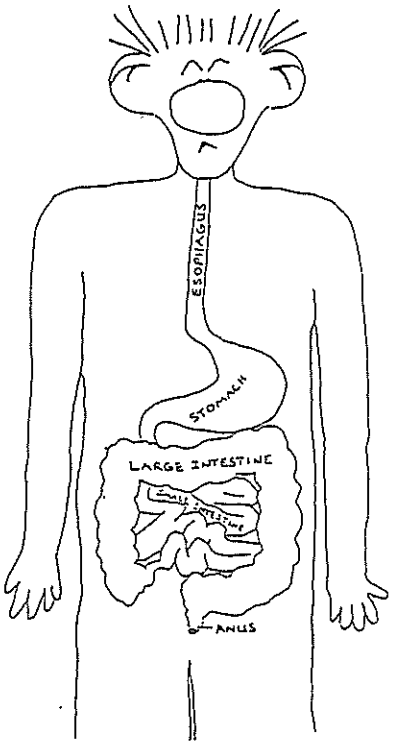


* The bladder muscles are very important in pushing the urine out of the body.

It is important that all urine is removed from the bladder when it is emptied.

Urine that remains in the bladder for a long time can cause a urinary infection.

STOOL REMOVAL



Food moves from the stomach to the small intestine and then through the large intestine.

The food that is not used by the body is pushed out through the anus. This waste is called stool (shit).

* The abdominal muscles are important in helping to push the stool out of the body.

Stool must be removed from the intestine regularly.

If stool remains in the intestine for a long time, it will prevent new food from passing and may cause severe illness.

Constipation is a word that means unable to pass stool.

For patient's with spinal cord injuries, the nerves that tell the bladder and abdominal muscles to work may be damaged.

If the muscles of the bladder and the abdominal muscles do not work, the patient must learn how to manually remove urine and stool. (See pages 43-44.)

d. respiratory problems

Questions:

1. Patients that stay in bed for a long time can have respiratory problems. Please describe two respiratory problems these patients could have.

_____

_____

_____

Questions:

2. Patient "A" has a C6 complete SCI. Patient "B" has a L1 complete SCI. Which patient will need more special care for breathing exercises. patient "A" or patient "B"?

_____

Why?

_____

_____

_____

_____

The spinal cord injury patient must be able to bring enough air into the lungs and keep the airways clear of secretions.

Diaphragmatic breathing, chest expansion, and coughing exercises can help the SCI patient with breathing. (See RESPIRATORY chapter, Volume 2).

4. STAGES OF RECOVERY FOR SPINAL CORD INJURED PATIENTS

The spinal cord injured patient may experience four different stages in their recovery.

Not all spinal cord injuries will follow all of these stages. The stages will depend on the type of injury and advice of the doctor.

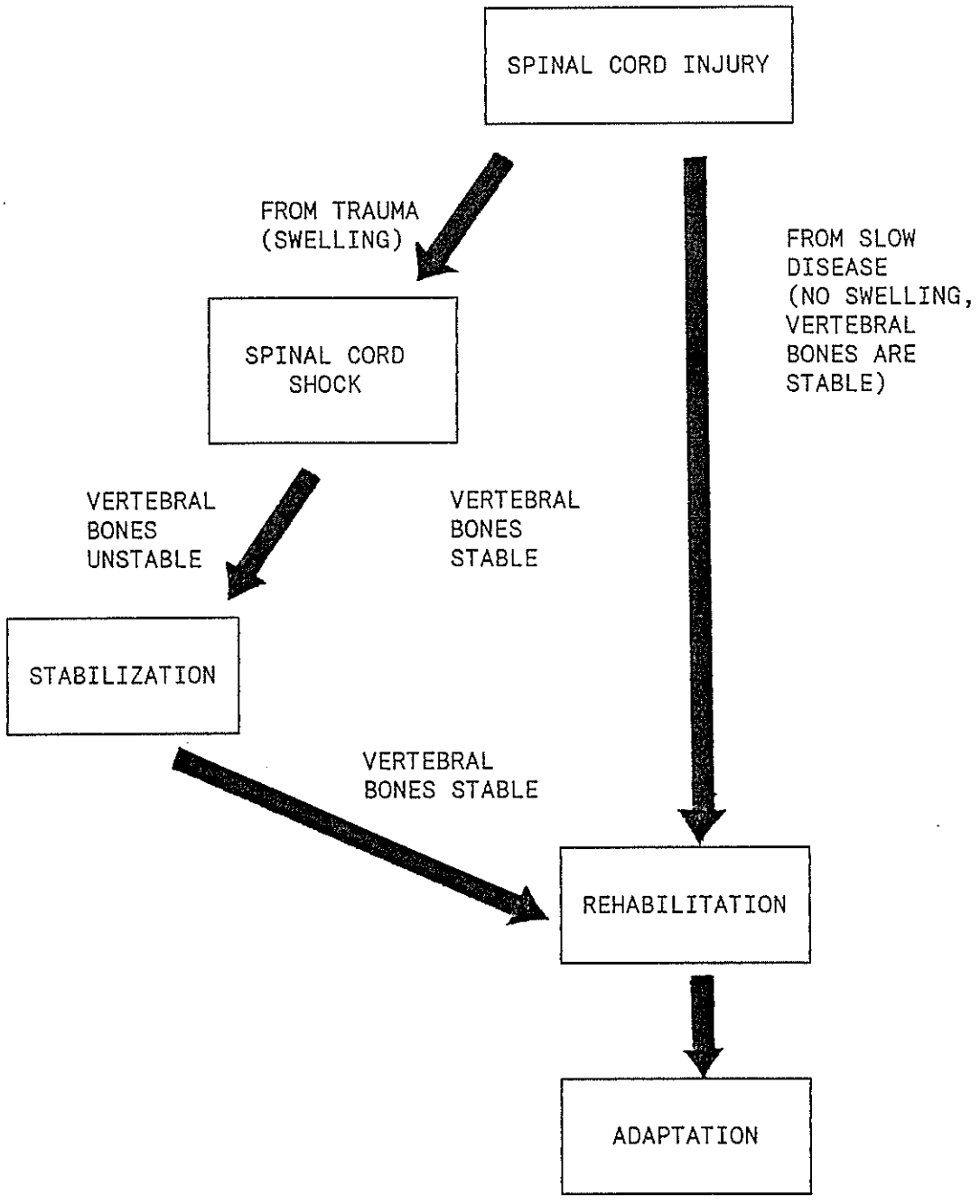
The four general stages are:

a. SPINAL CORD SHOCK

b. STABILIZATION

c. REHABILITATION

d. ADAPTATION

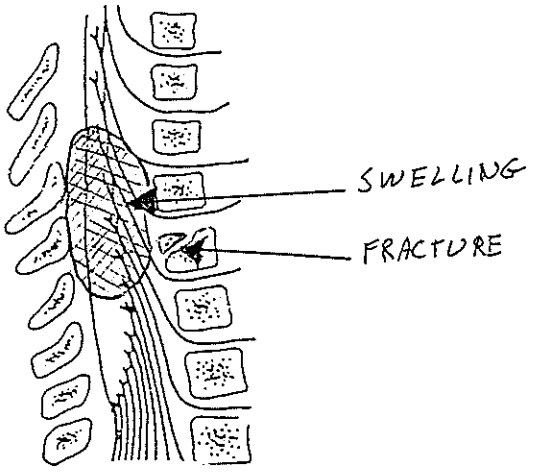


a. SPINAL CORD SHOCK

Spinal cord "shock" appears with traumatic spinal cord injuries.

All trauma causes swelling (Examples: fractures and dislocations)

Trauma with the vertebral colum will cause swelling that will put pressure on the spinal cord.



This pressure will cause <u>symptoms</u> that look like complete spinal cord injury.

After 2-3 weeks, the swelling will decrease and the pressure in the spinal cord will stop.

At this time, patients with <u>incomplete</u> spinal cord injuries may start to have increased feeling or movement that they did not have immediately after the injury.

This is because the <u>undamaged part</u> of the spinal cord can continue to deliver messages to and from the brain.

Changes may continue up to to one year afer injury.

With <u>complete</u> spinal cord injuries, feeling and controlled movement will <u>not</u> return to the areas that are below where the spinal cord was destroyed.

IMPORTANT

THE SPINAL CORD CANNOT BE REPAIRED

IF A PART OF THE SPINAL CORD HAS BEEN DESTROYED
(COMPLETELY OR INCOMPLETELY) IT WILL NOT RECOVER

A DESTROYED SPINAL CORD WILL REMAIN DESTROYED FOREVER

It is important for the PTA to understand about spinal cord injuries to know how to treat the patient and what to expect for recovery.

Question:

A man has an incomplete spinal cord injury. A PTA tells him him that he may be able to move and feel again because the nerves in the spinal cord can repair themselves. Do you agree with what this PTA has said.

Yes _____ No _____

Explain your answer.

_____

_____

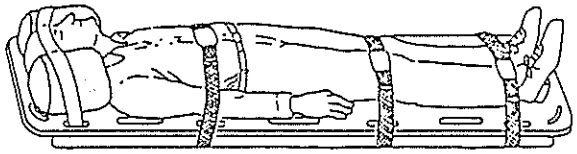
_____

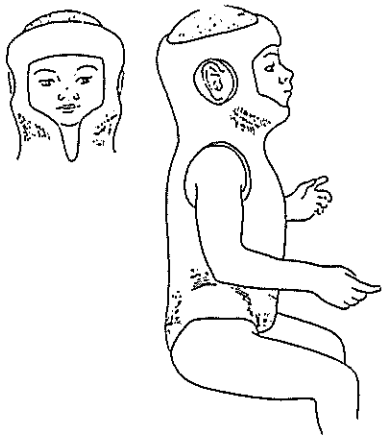
_____

b. STABILIZATION

Most often, stabilization is needed after injuries to the vertebral bones (fractures, dislocations).

In this period, the vertebral column is immobilized to help with bone consolidation and prevent more damage because of bone movement.





The type of immobilization used will depend on the type and location of the vertebral colum, and the doctors decision.

The patients activities will be limited because of the need to keep the vertebral bones as quiet (no movement) as possible.

Depending on the injury and following the doctor's instruction, this stage may last from 1 - 3 months.

c. REHABILITATION

This stage begins when the vertebral colum and spinal cord are stable.

Depending on the injury and following the doctor's instructions, this period may begin directly after SCI or after 1-3 months.

d. ADAPTATION

After the type and location of the spinal cord injury are known, the patient must understand that their movement may never be the same.

When rehabilitation is complete, the patient must be able to physically and mentally adjust to their new level of ability.

A change in occupation and lifestyle may be needed.

D. MEDICAL TREATMENT FOR A SPINAL CORD INJURY

> If the spinal cord has been cut or destroyed,
> no medicine or medical treatments can make it recover.

Medical treatment tries to PREVENT more damage to the injured area.

Medical treatment can include:

* surgery

* immobilization

Medicines can be given to try to help decrease pain and spasticity.

E. PHYSICAL THERAPY EVALUATION OF PATIENTS WITH A SPINAL CORD INJURY

The PTA must evaluate the spinal cord injury patient many times to monitor the changes that occur with treatment and time.

PTA evaluation suggestions are given for each period of SCI.

SPINAL SHOCK

* general condition of the patient

* psychology, family support

* skin conditions

* respiratory function

* urinary function

STABILIZATION

* skin condition

* respiratory function

* range of motion

* muscle strength

* sensation

* urinary function

* psychology, family support

REHABILITATION

* skin condition

* respiratory function

* urinary function

* range of motion

* muscle strength

* sensation

* functional abilities

* self care activities

* use of equipment

* psychology, family support

ADAPTATION

* house adaptations

* patient integration into the community

* patient independence

* psychology, family support

E. PHYSICAL THERAPY TREATMENT OF PATIENTS WITH A SPINAL CORD INJURY

The goals of Physical Therapy for patients with SCI are to:

* prevent complications

* help the patient to be as independent as possible

* provide necessary equipment

P.T. treatments will be given for each of the different periods:

1. SPINAL SHOCK

2. STABILIZATION

3. REHABILITATION

4. ADAPTATION

1. SPINAL SHOCK

The PTA must follow the doctor's instructions very carefully during this period!

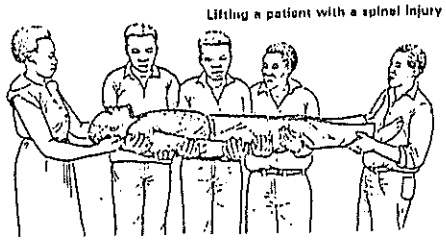
Physical Therapy in spinal shock period includes:

a. prevent pressure sores

b. prevent respiratory problems

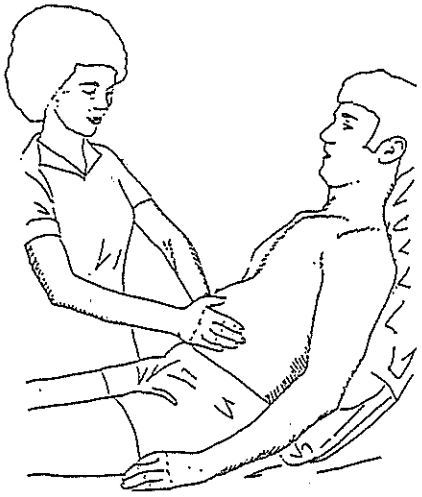
c. give psychological support

a. prevent pressure sores


Lifting a patient with a spinal injury

The patient must be carefully turned (no rotation or bending of the trunk) every 3-4 hours to prevent too much pressure on one area of the skin.

b. prevent respiratory problems



Breathing exercises are given to keep the lungs clear and active. (See RESPIRATORY chapter, Volume 2.)

Diaphragmatic breathing for tetraplegics is very important because all of the other breathing muscles are damaged.

c. <u>psychological support</u>

The PTA can also give psychological support to the patient and family.

This support can help to decrease their fear and better understand the patient's condition.

The PTA can explain to the family about a SCI, answer questions, and be optimistic but also realistic about the patient's possibilities.

2. <u>STABILIZATION</u>

Remember, all patients will be different.
The PTA must follow the doctor's instructions in this period.

<u>Question</u>:

Doctors are not trained as specialists in Physical Therapy. Why must the PTA follow the doctor's instructions during the spinal shock and stabiization periods?

_____

_____

_____

Physical Therapy in stabilization period includes:

a. prevent pressure sores

b. prevent respiratory problems (continue breathing exercises)

c. continue psychological support

d. maintain normal range of motion

e. begin strengthening exercises

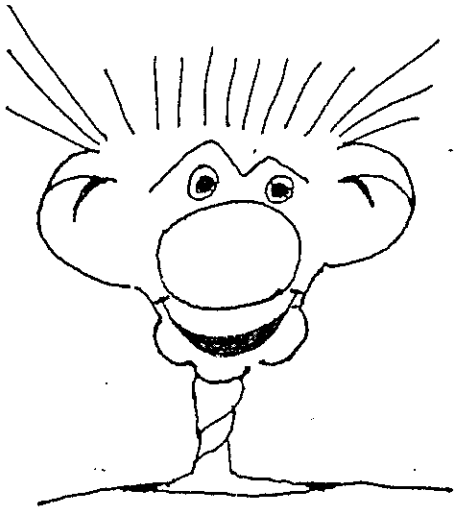
f. begin to evaluate the level of injury

a. <u>prevent pressure sores</u>)
) SEE SPINAL SHOCK PERIOD
b. <u>prevent respiratory problems</u>)

c. <u>continue psychological support</u>

During this period the PTA must begin to tell the patient about the work that the PTA and patient will do together to prevent the patient from becoming depressed and dependent.

It is important for the PTA to motivate the patient to help himself as much as possible.



d. maintain normal range of motion

The methods to maintain normal ROM are:

a) good bed positioning

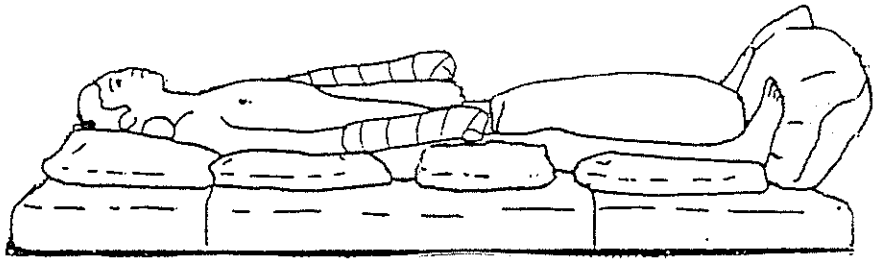
b) moving the limbs through their range of motion.

a) good bed positioning

Paraplegics and tetraplegics who cannot control the ankle muscles will need support for the foot (ankles) to prevent stiffness in a plantar flexion position.

A padded board can be used to help keep the foot in dorsiflexion when the patient is in bed.

If possible, the upper limbs should be a little elevated to prevent swelling.



b) moving the limbs through their range of motion

According to the abilities of the patient, the different levels of ROM techniques can be used (see RANGE OF MOTION chapter, Volume 2).

The PTA must be careful to move the limbs through the NORMAL range of motion only.

The SCI patient cannot feel and will not be able to tell the PTA if he has made too much movement.

SPECIAL NOTE:

On page 19 we have said that tightness in the wrists and fingers can be useful for some tetraplegic patients.

Activity:

A. Relax your fingers and completely flex the wrist.
What is the position of your fingers?

_____

B. Relax your fingers and now completely extend the wrist.
What is the position of your fingers?

_____

With wrist flexion the fingers passively open.

With wrist extension, the fingers passively close.

For patients that have wrist extensors that work and finger flexors that do not work, a tightness in the finger flexors can help to pick something up.

The strength of this passive wrist-finger movement can be increased with a special device called the FINGER FLEXOR GLOVE.

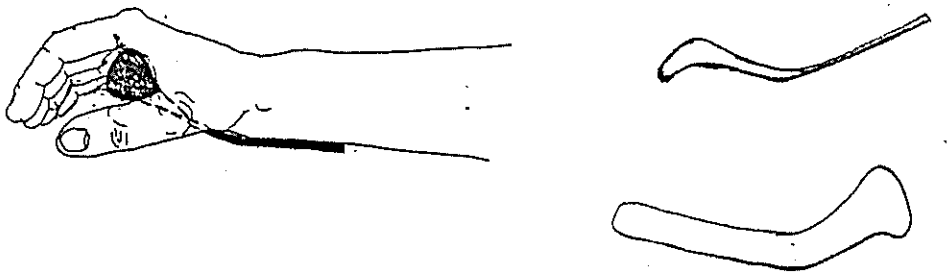
This "glove" helps to hold the hand in 3 main positions.

a. wrist extensors (a little)

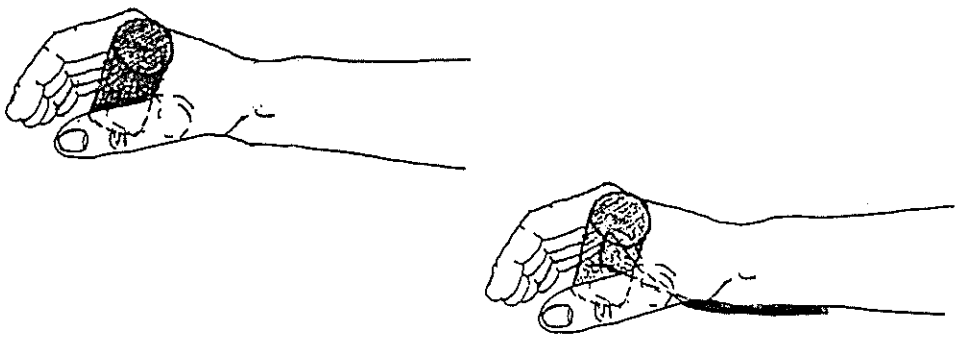
b. finger flexion

c. thumb opposition

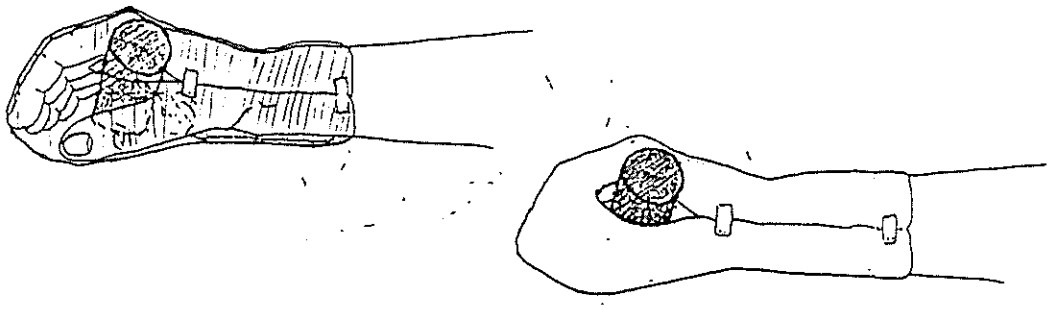
a. small amount of extension is held by plaster or metal



b. opposition is made by putting the thumb around a roll



c) finger flexion is held by an elastic bandage



If possible, the patient should wear this glove every night.

During the day, the PTA must help the patient practice to use this passive grasp method.

NEVER PUSH FINGER EXTENSION WITH WRIST EXTENSION
FOR TETRAPLEGIC PATIENTS !

Question:

A patient has no movement at the wrist. Is it important to allow tightness of the finger flexors for this patient?

Yes _____ No _____

Explain your answer.

_____

_____

_____

e. strengthening exercises

Muscle function may begin to return in some muscles.

The PTA must help to make these muscles strong by giving appropriate strengthening exercises (see STRENGTHENING chapter, Volume 2).

Question:

A patient has C7 incomplete quadriplegia. She has a little movement of the ankles and toes. Will you do strengthening for these areas?

Yes _____ No _____

Explain your answer.

_____

_____

_____

f. begin to evaluate the level of injury

Methods to identifying the functional level of a spinal cord injury were discussed on pages 7-14.

These methods include muscle testing and sensory testing.

The PTA must review muscle testing techniques (see MYOLOGY chapter, Volume 1) and sensory testing techniques (see NEUROLOGY chapter, Volume 1).

Modifications of muscle testing techniques may be needed if the spinal cord injury patient is unable to be in the testing positions.

3. REHABILITATION

After the vertebral column has consolidated
or when trunk movements will not damage the spinal cord,
rehabilitation period begins.

Physical Therapy in this rehabilitation period includes:

a. continue breathing exercises

b. continue psychological support

c. maintain normal range of motion

d. continue strengthening exercises

e. monitor changes in strength and sensation

f. teach patient/family self care activities

g. verticalization

h. focus on functional activities and provide equipment

NOTE:

All of the activities and exercises given in rehabilitation period will depend on the level and type of spinal cord injury.

The PTA must be optimistic and must also be realistic about what a patient will be able to do.

Questions:

1. A patient has C5 complete quadriplegia. Will you work on sitting balance with this patient?

Yes _____ No _____

Why or why not?

_____

_____

_____

_____

_____

_____

2. A patient has L3 incomplete paraplegia. What are three things that you can expect this patient to do independently?

_____

_____

_____

_____

_____

_____

a. continue breathing exercises

Question:

A C7 complete quadriplegic has secretions in the lower part of both lungs. Please list 3 things you can do to help this patient.

_____

_____

_____

b. continue psychological support

During rehabilitation period the PTA must help motivate the patient to become as independent as possible.

The patient must not "wait" for recovery but must "work" for recovery.

The PTA must give positive feedback for successes (or good attempts) and help give exercises that the patient can feel he has made progress.

DO NOT PUT THE PATIENT IN FAILURE SITUATIONS....
help the patient to begin to like himself for who he is.

c. maintain normal range of motion

During rehabilitation period the patient should learn Self-ROM if possible (see pages 47-48).

d. continue strengthening exercises

Strengthening must be given for all muscles that have some movement.

During rehabilitation period, strengthening exercises should be made together with functional activities

e. monitor changes in strength and sensation

Question:

Please give 2 reasons why it is important to monitor a SCI patient's strength during rehabilitation period.

_____

_____

_____

f. teach patient/family self care activities

If possible, the SCI patient must learn to be independent in maintaining good health.

The family must be involved in learning these activities to help the patient when it is needed.

Self care activities include:

a) management of bladder and intestine

b) pressure sore prevention

c) self range of motion

a) management of bladder and intestine

BLADDER MANAGEMENT

Questions:

1. What is the function of the bladder?

2. Why are bladder muscles important?

3. Explain why a patient with a complete spinal cord injury will have a problem urinating (peeing).

We said on page 19 that it is best to empty the bladder completely to prevent urinary infections.

As a result of nerve damage, the muscles of the bladder may not function normally.

If the bladder muscles do not function normally, the patient must manually help to empty the bladder.

After nerve damage, the bladder muscles could be spastic or flaccid.

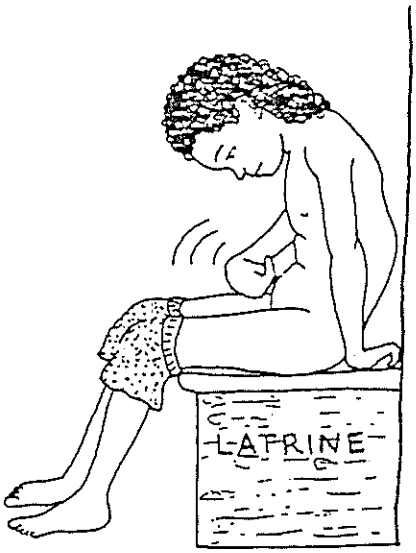
A patient that has a flaccid bladder needs to push (constant pressure) over the bladder area to help remove the urine.

Push down over the bladder with the hands.

A patient that has a spastic bladder needs to tap (intermittent pressure) over the bladder area to help remove the urine.

In some patients, this pushing or tapping does not help remove the urine.

In this case, the patient would need a catheter (a tube that drains the urine always).



The spinal cord injury patient should always drink A LOT of water!

<u>At least two liters every day.</u>

To prevent urinary infections, drink LOTS OF WATER

A full bladder is easier to empty, and large amounts of liquid help to keep the urine passing regularly.

The PTA must teach the patient (and family) the techniques of how to help the patient pass urine.

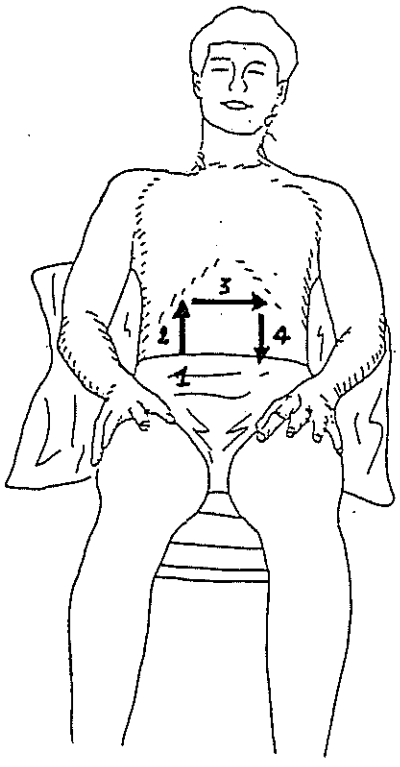
To help to avoid complications, the SCI patient must continue these techniques for the rest of his life.

BOWEL MANAGEMENT

If the patient has difficulty passing stool, <u>deep massage</u> (see MASSAGE chapter, Volume 2) in the abdominal area may help.

It is important that massage is given in the right direction.

(Help to push the stool toward the anus, not the stomach!!)



<u>Direction to give massage:</u>

1. begin in the lower right side of the abdominal area.
2. move the hands superiorly.
3. move the hands toward the left side of the abdominal area.
4. move the hands inferiorly and toward the anus.

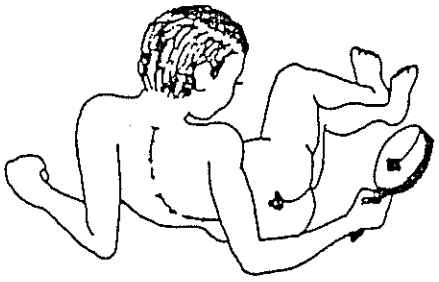
b) pressure sore prevention

Pressure sores (bed sores) are explained in PRESSURE SORES chapter, Volume 3).

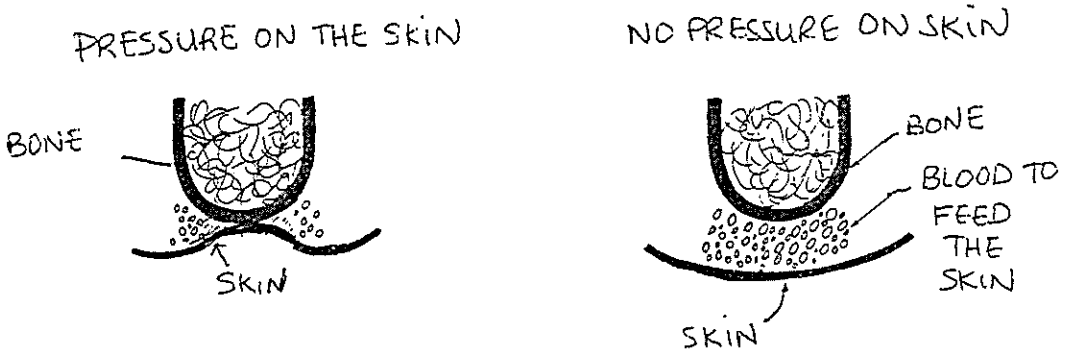
We have said that pressure sores can be a complication for patients with spinal cord injuries (pages 16-17).

The SCI patient cannot feel many areas of the body and must work hard to prevent pressure sores.

The SCI patient must learn how to regularly check the skin (with mirror or help of the family) over sensitive areas (page 17).

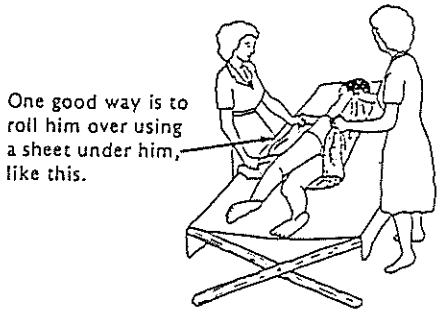


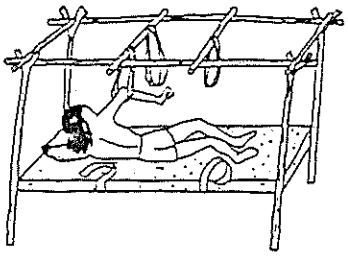
The SCI patient can prevent pressure sores by regularly shifting his weight so that the blood can arrive to all areas of the skin.



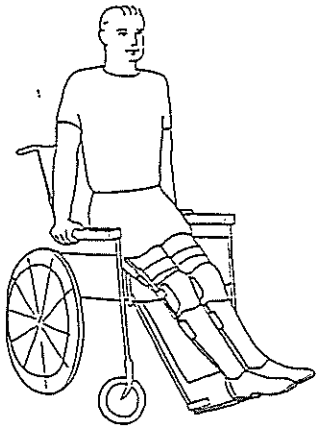
The patient can do this by:

(a) changing positions in bed

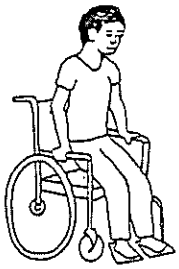




b) doing arm push ups from bed or chair



c) leaning to the left or right side in the chair



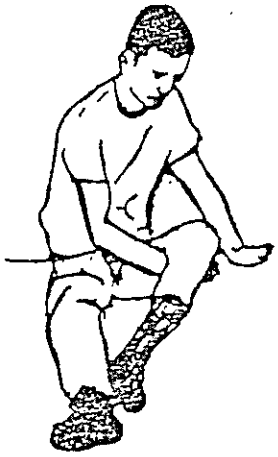
c) self-range of motion

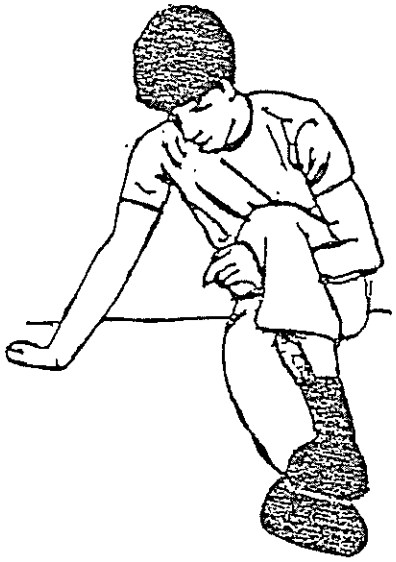
The patient or family must learn how to make range of motion.

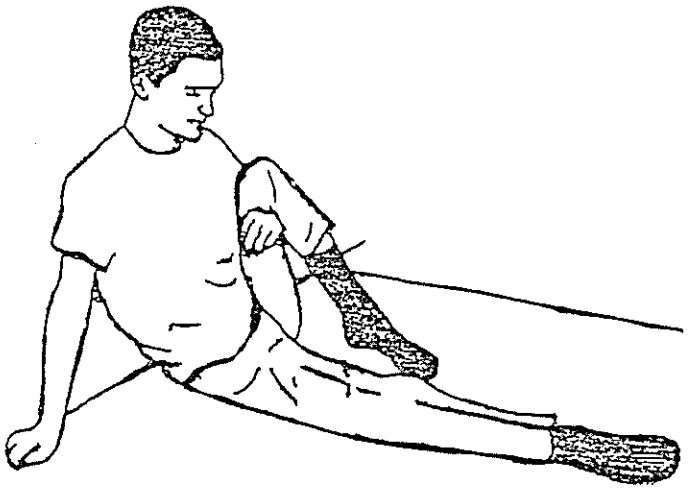
For SCI patients that have good arm and trunk muscles, self-ROM should be encouraged.

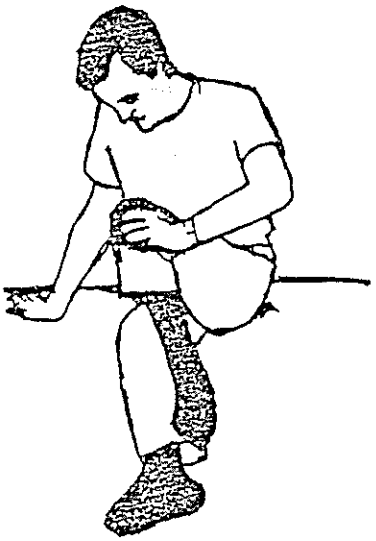
For patients unable to independently make ROM, the family must be encouraged to do this everyday.

Examples of self-ROM techniques are given below.









g. verticalization

Verticalization is sitting and standing positions.

Standing positions are good for all SCI patients during rehabilitation stage because:

* this stimulates the bones of the lower limb so that they remain strong

* it helps stimulate intestine and bladder for better waste removal

* it helps the circulatory system be more active

* it makes the patient mentally feel better

Verticalization is a STEP BY STEP process.

This means the patient does not go from supine to standing in one day.

A special table "tilt table" is used to help stand patients step-by-step.

Rules to remember when putting a patient on a tilt table:

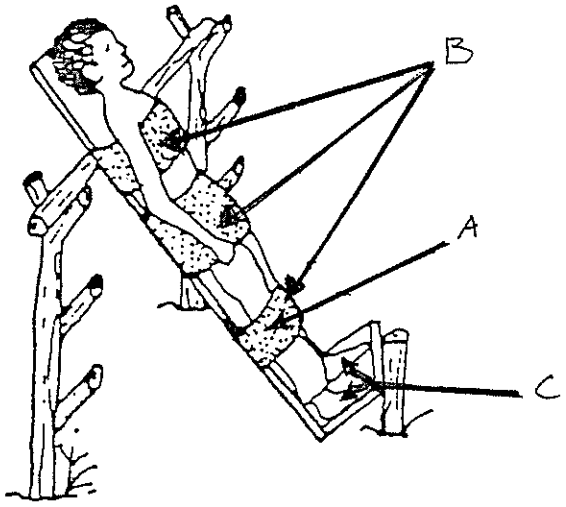
A. bandage a patient's legs before standing; this will help keep the blood equal in the body

B. attach the patient to the table very well so that he doesn't fall

C. take care that feet/legs are in a good position

* if the patient feels dizzy, return him to near horizontal position

* if possible, it is good to have the SCI patient stand 1 - 2 times each day for 15 - 30 minutes each time



h. Focus on functional activies and equipment needs

Functional activities include:

* moving in bed

* sitting

* eating/dressing/bathing

* transfers

* wheelchair use

* braces/walking aids

* MOVING IN BED

As soon as possible the SCI patient should learn and practice how to move in bed as independently as possible.

This will help the patient to be more responsible in his care (prevent pressure sores) and provide a base for other activities (sitting, eating, etc).

Bed adaptations are very important to help encourage this independent movement in bed.

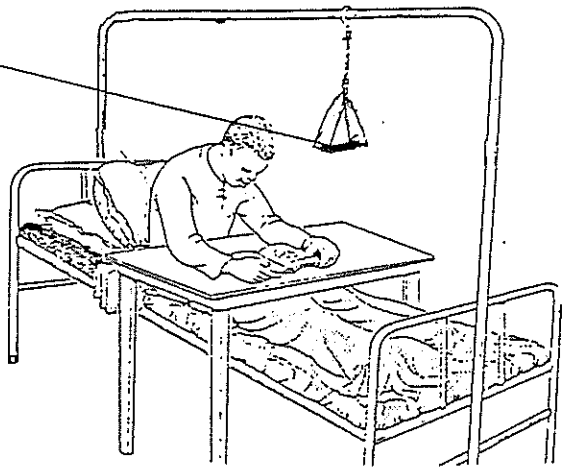
On the next page are pictures of 3 types of bed adaptations that the patient can use to help him move in bed:

TRAPEZE

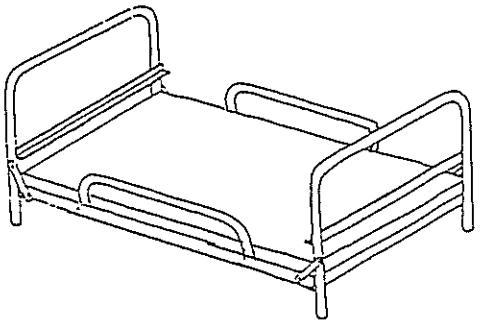
SIDE BARS

LADDER

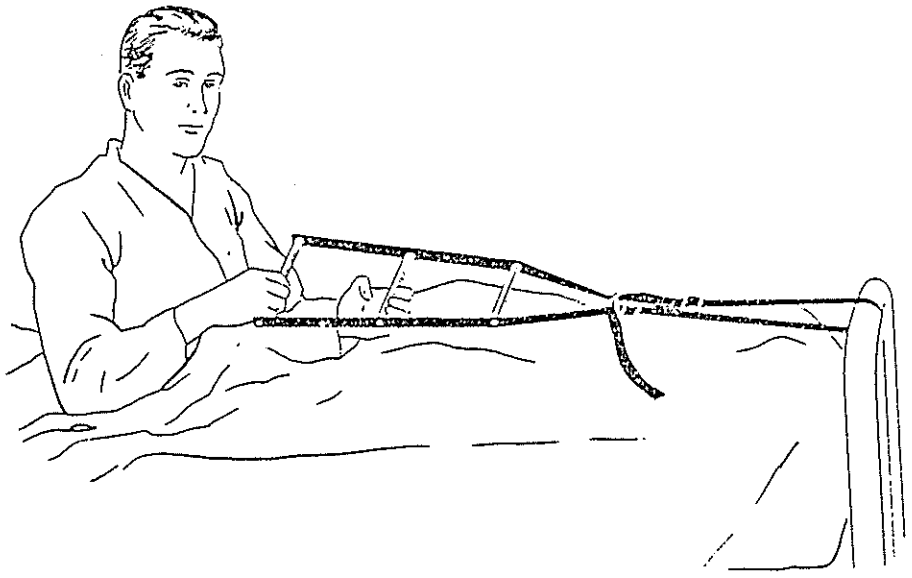
TRAPEZE



SIDE BARS



LADDER



* SITTING

Sitting is a very good position for all SCI patients. In this position, the patient can safely eat, see the area and people around him, and feel less dependent and disabled.

Questions:

1. What is the better position to eat and drink (sitting or lying on the back)?

   _____

   Explain your answer.

   _____

   _____

   _____

2. Why is it important for an SCI patient to sit and see the area and people around him?

   _____

   _____

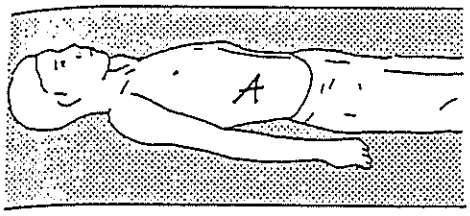
   _____

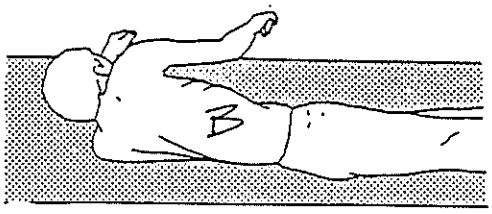
Methods to come to a sitting position and to remain in a sitting position will be different for quadriplegics and paraplegics.

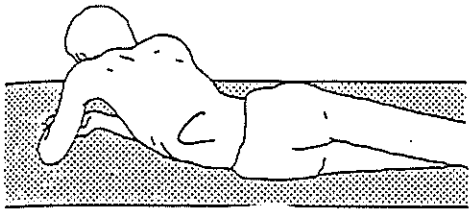
Question:

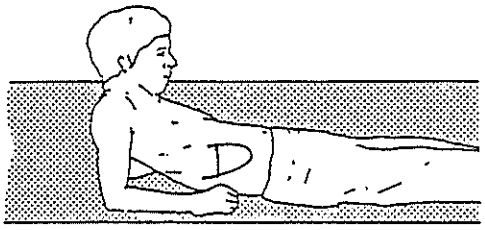
Quadriplegics have more difficulty than paraplegics to come to sitting and to remain sitting. Explain why.

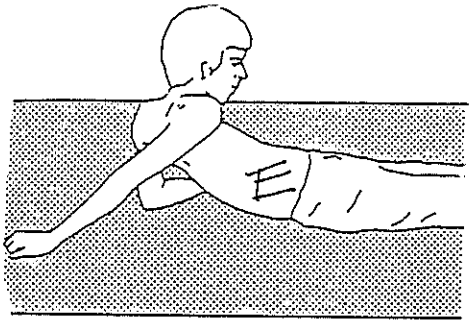
Methods to come to a sitting position can be seen in the pictures below.

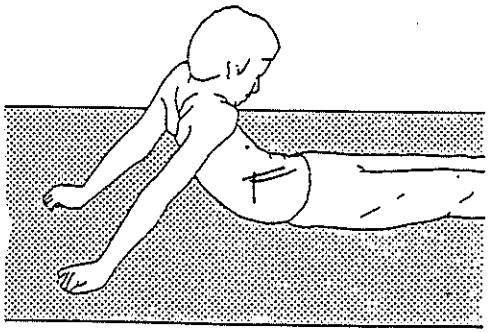


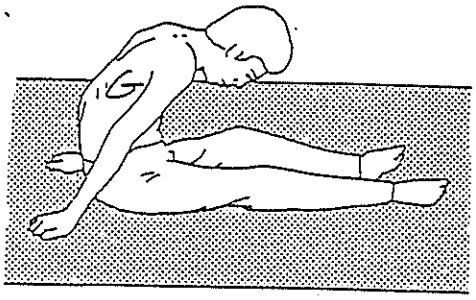




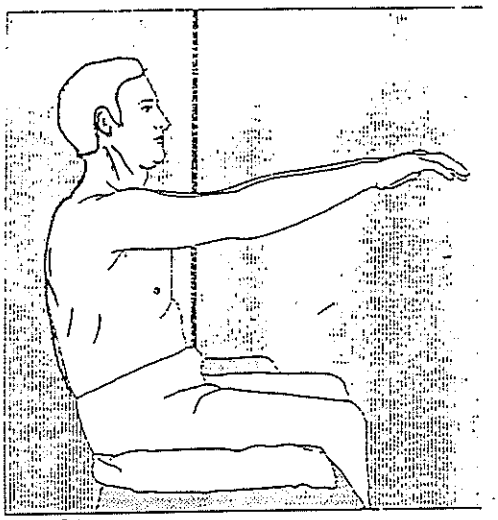




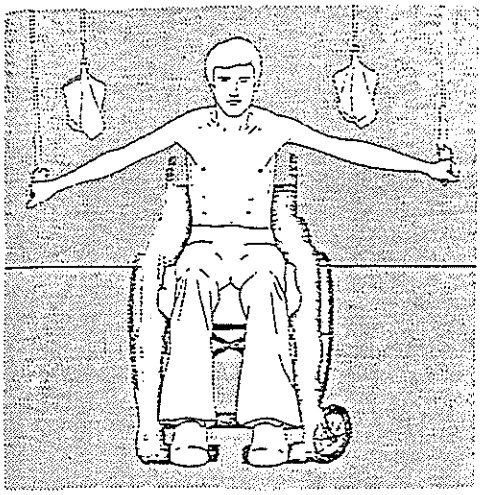




Once in sitting, the patient can work on strengthening exercises or balance exercises.



Balance position



Question:

Generally, balance exercises are more useful for a paraplegic patient that a tetraplegic patient. Please explain why.

_____

_____

_____

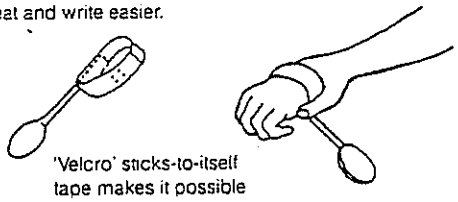
* EATING/DRESSING/BATHING

Again, as early as possible the patient must be encouraged to be as independent as possible for eating, dressing and bathing.

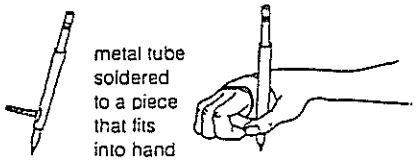
Below are picture of equipment that may help increase the autonomy of a patient.

For other suggestions, see DEVICES FOR AUTONOMY chapter, Volume 2.

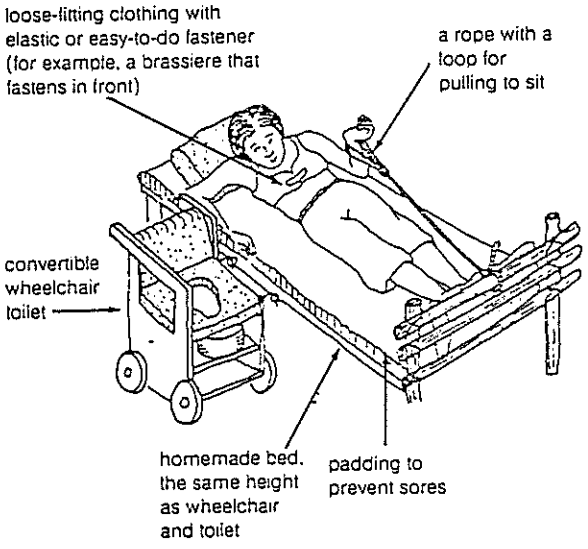
When hands are affected, devices like these (or others that you can invent) make relearning to eat and write easier.



'Velcro' sticks-to-itself tape makes it possible for the person to put on aids by herself.



metal tube soldered to a piece that fits into hand band



Questions:

1. A man is a L5 complete paraplegic. Will this man need special hand devices to help him eat?

   Yes _____ No _____

   Explain your answer.

_____

_____

_____

2. A patient is a C6 quadriplegic. This girl has good biceps muscles but weak hand muscles. Her mother says she cannot feed herself. What could you suggest for this patient to help her be more independent?

_____

_____

_____

* TRANSFERS

Transfers are moving from one surface to another surface. Different types of transfer techniques are described in TRANSFERS chapter, Volume 2.

Question:

Please give 2 reasons why transfers are more difficult for quadriplegic patients than paraplegic patients.

_____

_____

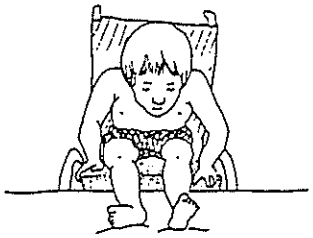
_____

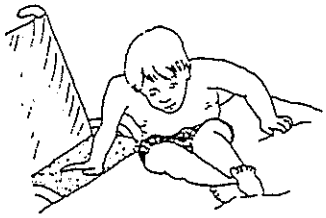
Because quadriplegic patients have decreased arm strength and trunk control, they will need extra help or devices to move from one surface to another.

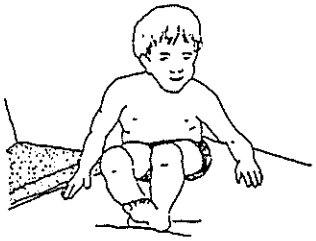
Paraplegics have better trunk and arm strength and should be able to transfer to different surfaces independently.

General rules for transfers:

- try to make both surfaces equal height





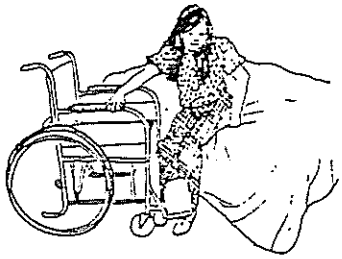


- may use a smooth board to put between the 2 surfaces to make the movement easier

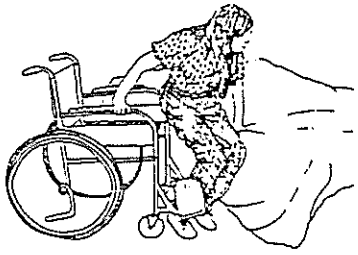
- if possible remove the armrest of the wheelchair on the side you are transferring toward

Pictures of different types of transfer techniques on given on the following pages.

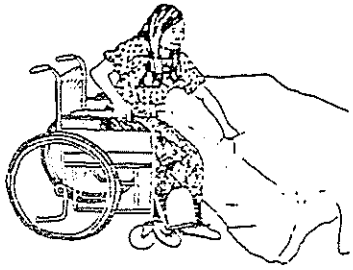
Transfer from cot or bed to wheelchair with armrests



1. Position your wheelchair so that you can swing body past armrests.

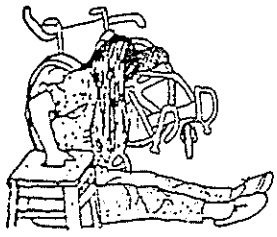


2. Place one hand on bed and one on the far armrest. Push yourself up while leaning forward with head down, weight over knees.

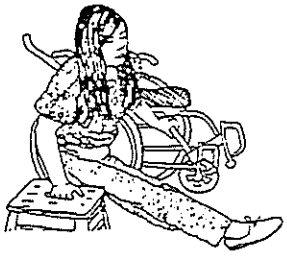


3. Swing body into wheelchair.

Transfer from floor to wheelchair — with help of a low seat

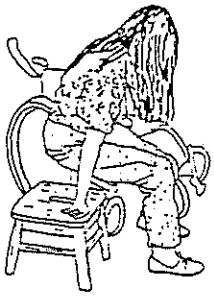


1. Sit with legs straight. Pull seat to your side opposite the wheelchair (a person's knee can also be used).

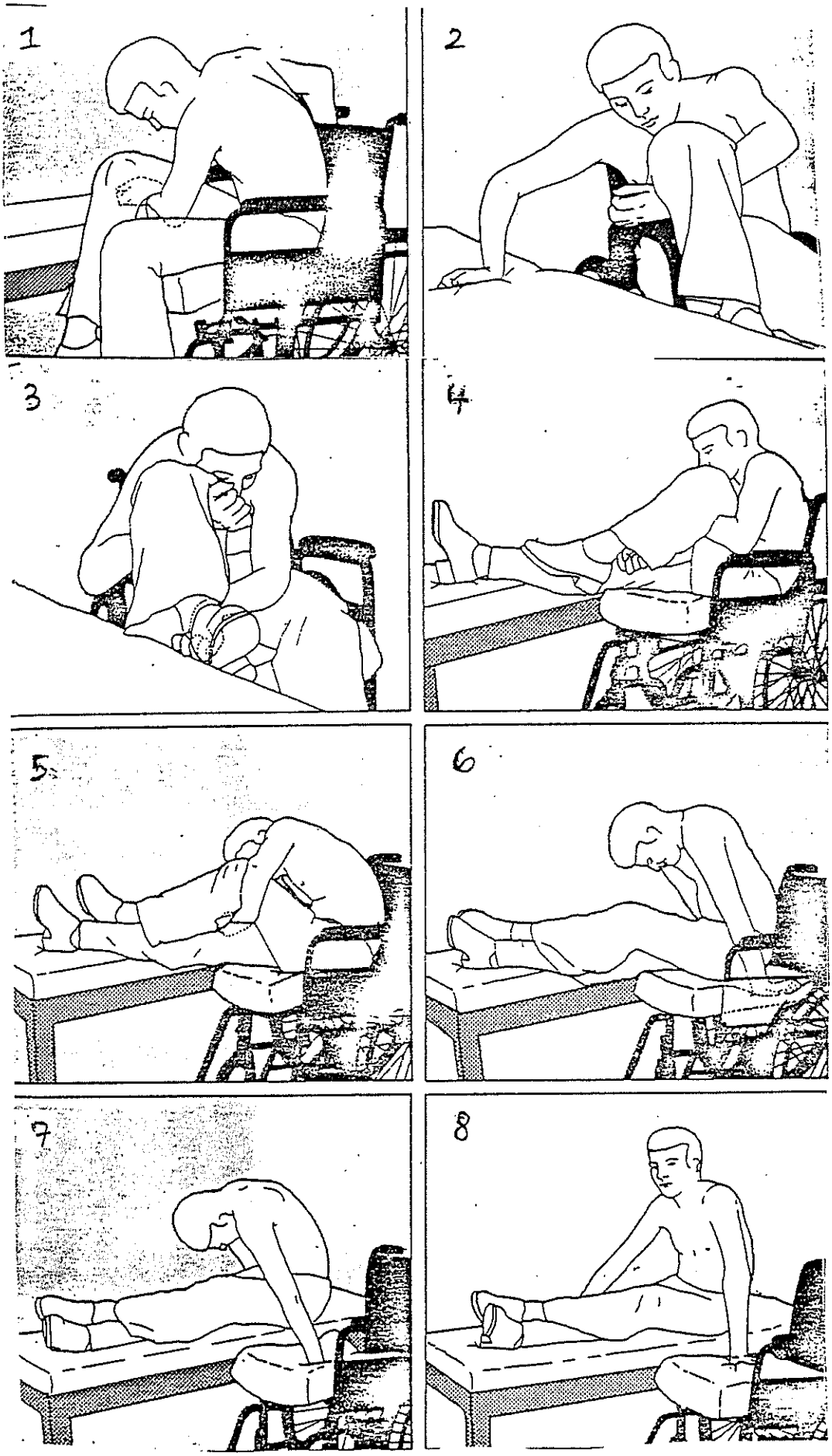


2. With hands on each chair, push up, with your head forward over knees.

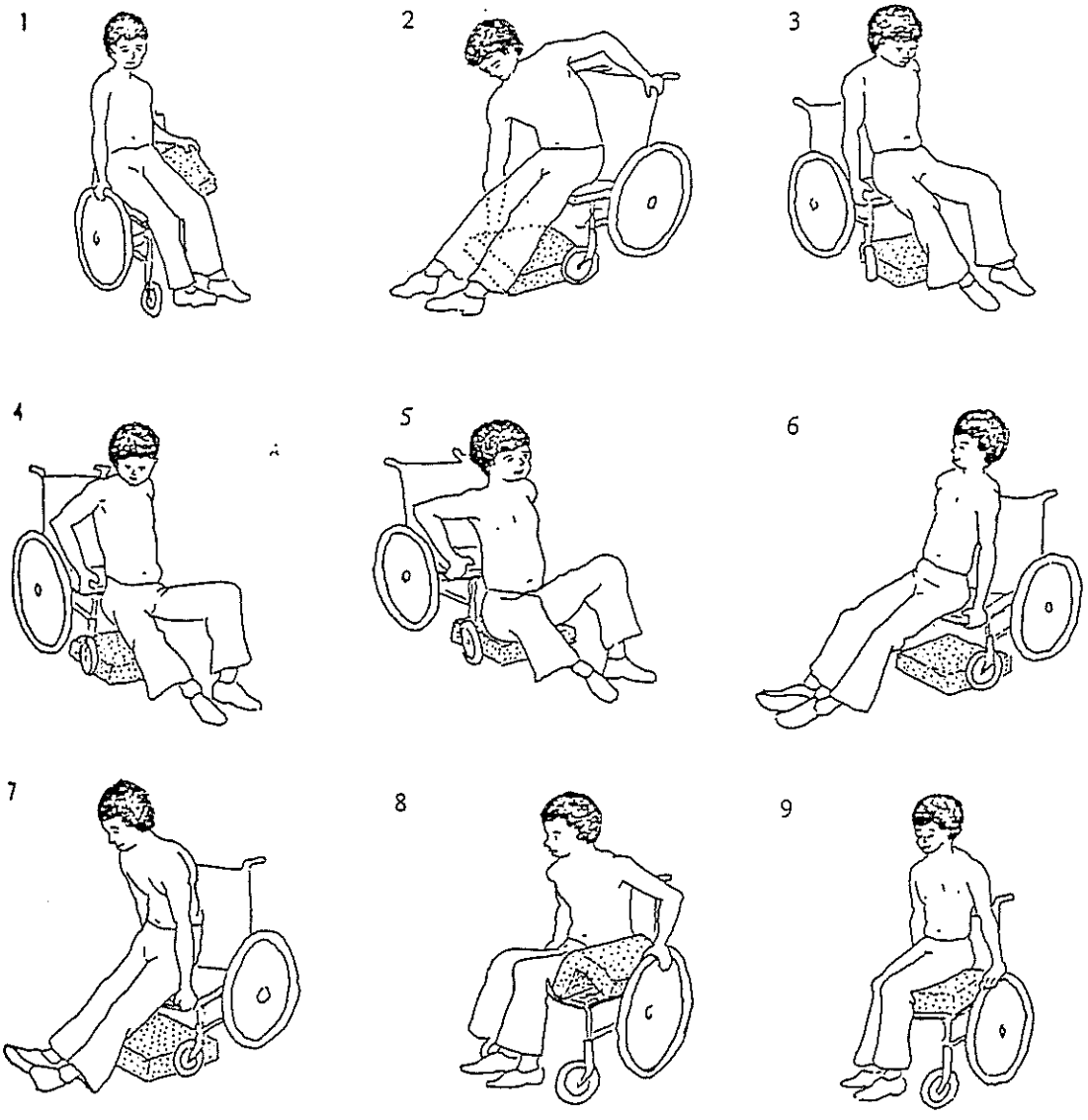
3. Swing onto the seat.



4. Now, with your head forward over your knees, swing body onto the wheelchair.


1
2
3
4
5
6
7
8

Transfer from wheelchair to floor—and back again—without help of a stool



* wheelchair use

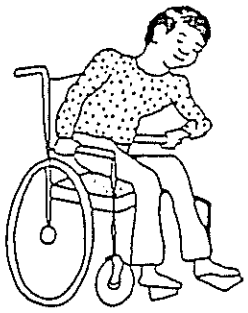
Specific information about wheelchairss is given in WHEELCHAIR chapter, Volume 2.

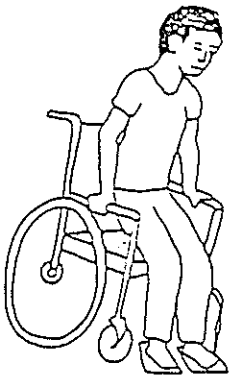
Generally people that cannot walk or can walk only with great difficulty can benefit from the use of a wheelchair.

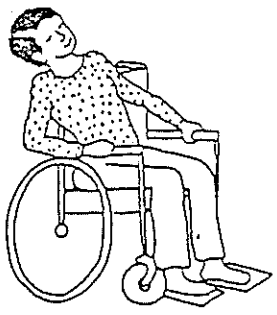
Patients with spinal cord injuries may spend a lot of time in their wheelchairs.

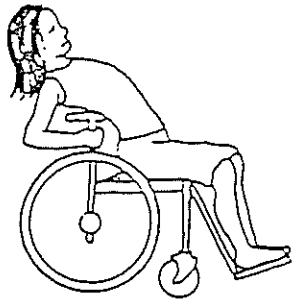
They must be reminded to shift their weight often (every 20 minutes for 2-3 minutes) to prevent pressure sores (see PRESSURE SORES chapter, Volume 3).

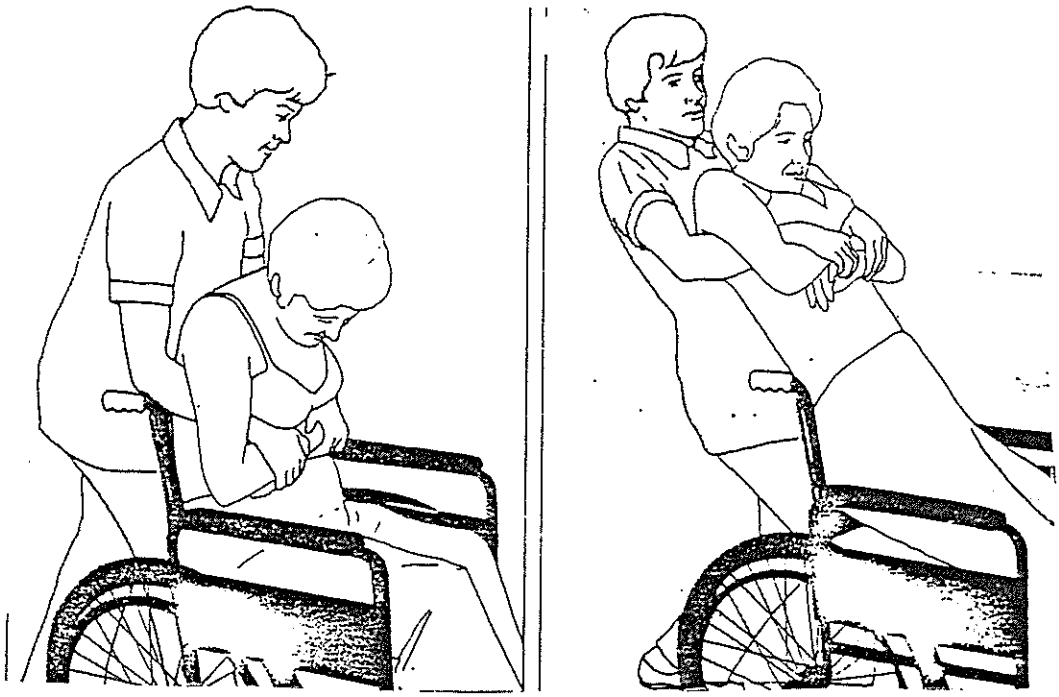
Ideas for ways to decrease pressure over some "sitting area" are seen in the pictures below.











Adaptions for the wheelchair will depend on the needs of the individual patient (See WHEELCHAIRS chapter, Volume 2).

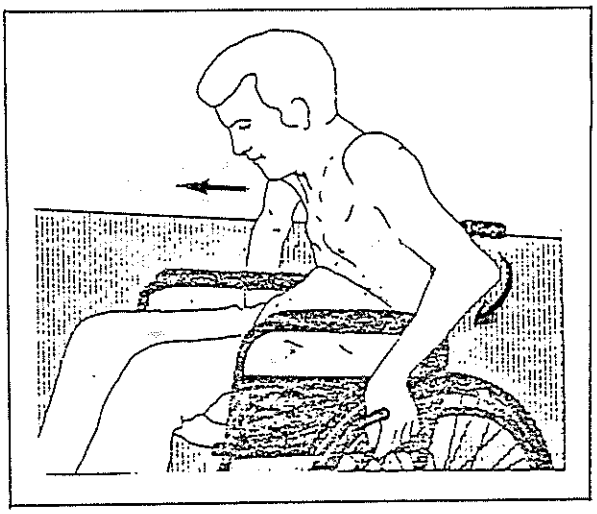
To help encourage the SCI patient to be out of bed, and doing useful activities in the wheelchair, a lap table can be made to fit on the arm rests of the wheelchair.

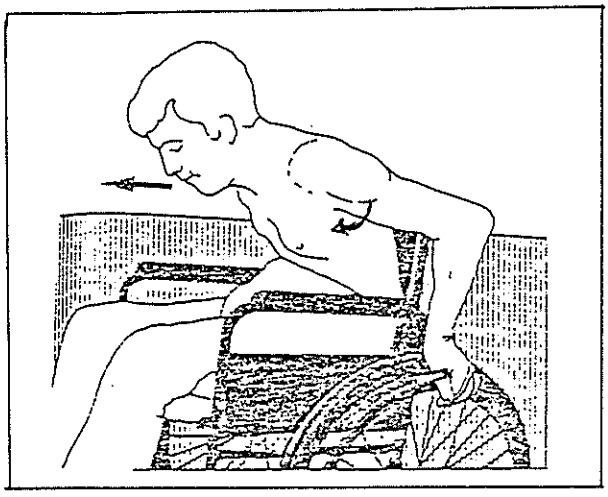
This "table" gives the patient a stable area to work with his hands and can help protect the legs from hot or sharp objects.

Moving the wheelchair forward can be made 2 different ways.

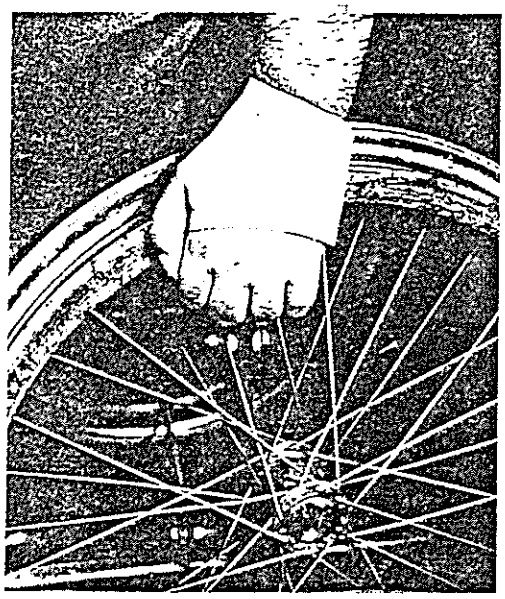
* using elbow extensors (most common)

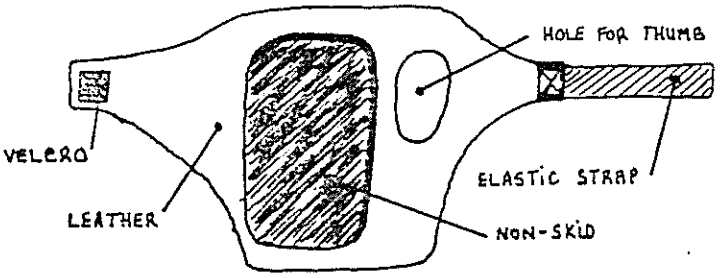
* using elbow flexors and shoulder flexors
(for patients that do not have elbow extensors that work)



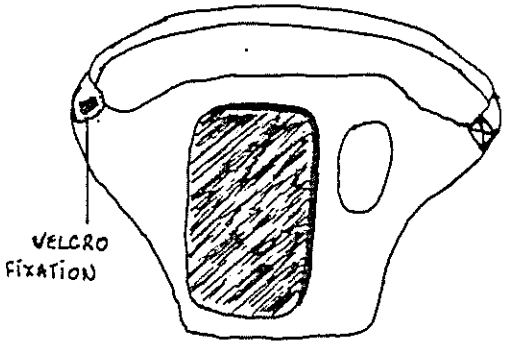


To help all patients with SCI have a better hold on the wheel, a special glove can be made. This glove helps the SCI patient push the wheel with less slipping and less damage to the hands.





NON-SKID GLOVE
(FOR RIGHT HAND)



* braces/walking aids

For patients with good trunk control, hip control and very good strength in the upper limbs, braces and walking aids may be used to help in walking. (See BRACES, and WALKING AIDS chapters, Volume 2.)

Braces will keep joints in a position so that weight bearing is possible (knee extension, ankle neutral).

The type of brace needed will depend on the type of SCI and how the muscles and joints of the lower limb are working.

For details about braces and brace use, please see BRACES chapter, Volume 2.

4. ADAPTATION PERIOD

During adaptation period physical therapy treatment will include:

* psychology and family support
* ensure independent and safety in activities learned in rehabilitation period
* house adaptations
* community integration
* plan for follow-up visits

* psychology and family support

The PTA should discuss with the patient and family that the big changes in how the patient can move have already happened.

The patient and family must continue to MAINTAIN the patient's current level of independence and good health.

In many cases the patient's level of independence can increase as the area around him is adapted to fit his needs.

* ensure independence and safety in activities learned in rehabilitation period

The PTA must check to make sure the patient and family identify what the patient can do, and what he needs help with.

If possible the PTA should travel to see the patient and family in their home to review all areas of rehabilitation.

* house adaptations

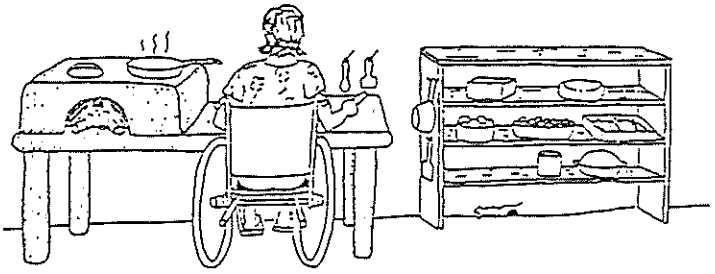
The main adaptation needed for the house is to be able to have a wheelchair enter and move about in the house.

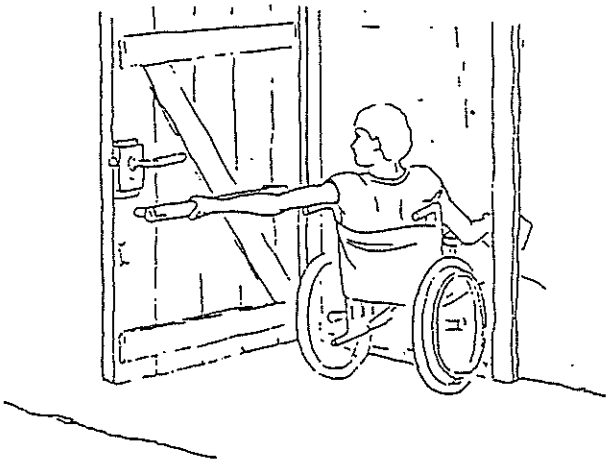
In addition, surfaces (bed, toilet) should be the same level to assist in transfers.

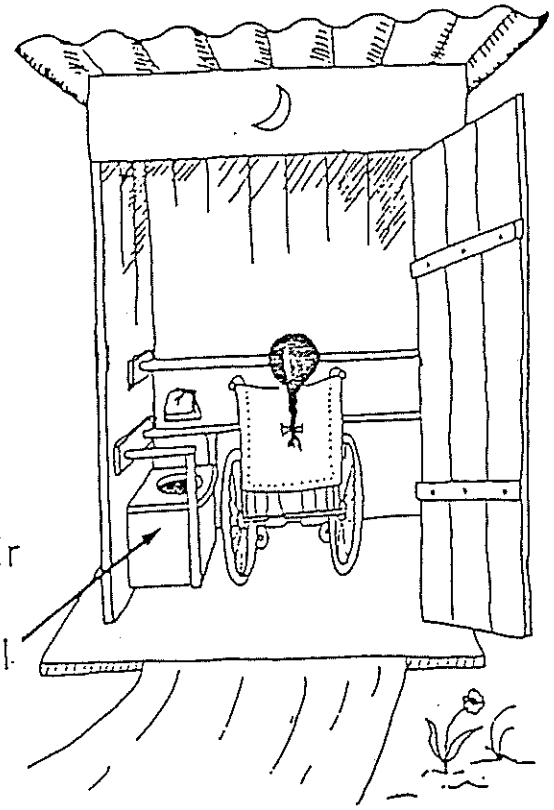
Adaptations for the bed to help mobility and the toilet for mobility, stool removal and washing should be included.

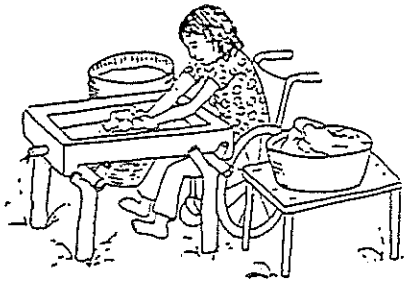
Details about house adaptations can be found in the chapter on HOUSE ADAPTATIONS.

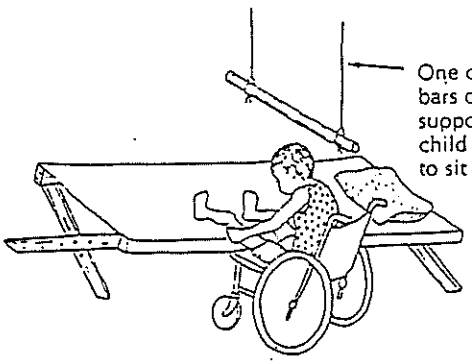
The pictures on the following pages help give ideas about how the house can be adapted so that a SCI patient in a wheelchair can continue to live as independently as possible.

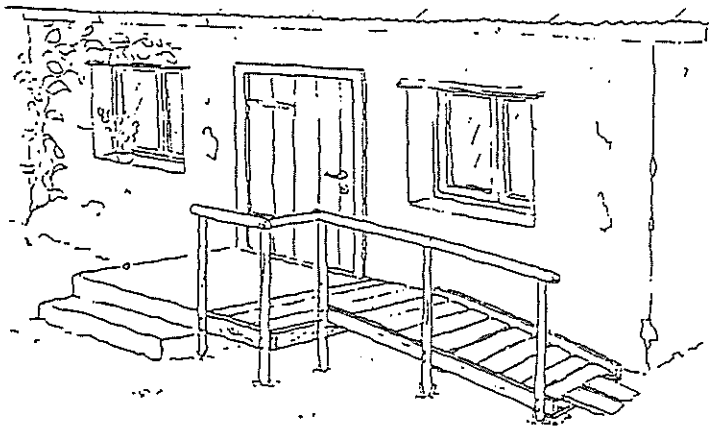


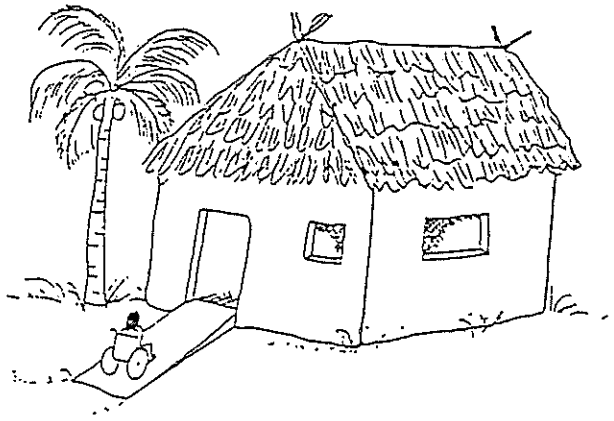


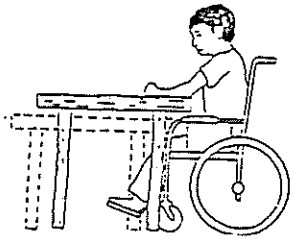

toilet
seat and
wheelchair
seat on
same level

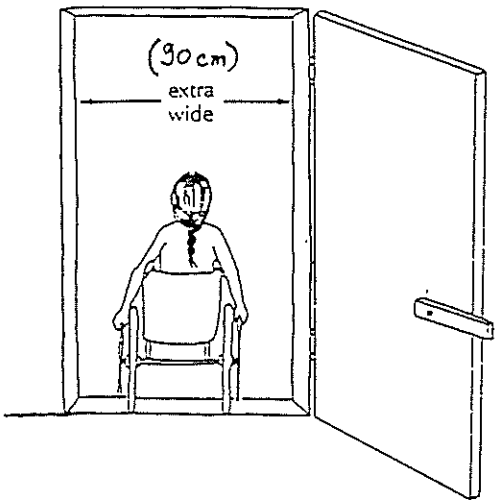



One or more hanging
bars or other
supports may help the
child to transfer or
to sit up in bed.








(90cm)
extra
wide

H. CHAPTER SUMMARY

A spinal cord injury is damage to the spinal cord.

The spinal cord carries messages about movement and sensation to and from the brain. If the spinal cord is damaged or destroyed, these messages cannot arrive.

Complete SCI means that the spinal cord is completely destroyed in one area and no message can pass.

Incomplete SCI means the spinal cord was not completely destroyed and some messages can continue to pass through this area.

IF PART OF THE SPINAL CORD IS DESTROYED, IT WILL NEVER RECOVER.

A person with a spinal cord injury will have problems with movement and feeling in all body parts below the level of injury.

Quadriplegia is problems with movement and feeling in the upper limbs, trunk, and lower limbs.

Paraplegia is problems with movement and feeling in the lower limbs (and sometimes trunk).

Spasticity is uncontrolled muscle contraction. Spasticity in spinal cord injuries is caused by reflexes (fast decisions made by the spinal cord causing a muscle contraction).

Complications from SCI are:

* pressure sores (bed sores)
* contractures (joint tightness)
* urinary tract infections
* respiratory problems

Suggestions on how to prevent these complications are given in this chapter.

The four stages of recovery that a SCI patient may experience are:

* SPINAL CORD SHOCK	from traumatic SCI where there is swelling that causes pressure in the spinal cord
* STABILIZATION	when vertebral bones are not stable they need to be immobilized to prevent more movement and damage to the spinal cord.
* REHABILITATION	vertebral bones are stable and it is time to work for the best functional recovery (strengthening and equipment).
* ADAPTATION	patient reintegrated into society, house adaptations, work possibilities.

Specific Physical Therapy evaluation and treatment suggestions are given for each stage of recovery.