



# POSTURE

- **POSTURAL ABNORMALITIES IN CP**
- **POSTURAL ABNORMALITIES IN HEMIPLEGIA**
- **POSTURAL ABNORMALITIES IN SPINAL CORD INJURY**

*Presented by:*

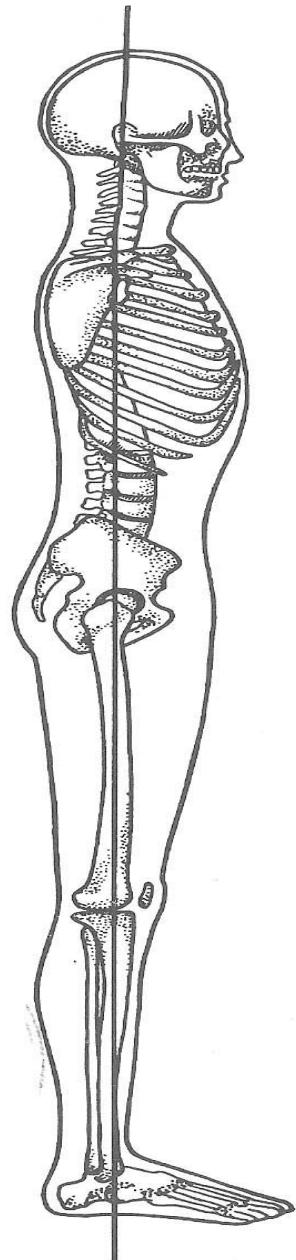
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19-01-2019

BPT 1ST SEM



**The line of gravity passes through-**

1. Head- ear lobe
2. Shoulder- center of tip
3. Hip- Greater trochanter of femur
4. Knee- posterior to the patella
5. Foot- anterior to the lateral malleolus of the fibula

Figure 3. The vertical gravity line of the body.

- Awareness of posture and the position of the body in space is the fundamental to balance training kinesiologic factors such as achieving and maintaining proper COG control and learning factors such as internalization of balance strategies provide the structural framework for the treatment postures chosen. The need to work on core trunk stabilization first, training may be initiated in a sitting position, which provide an opportunity to develop a sense of trunk posture and equality of wt. bearing while sitting. Posture is often considered to be a static function rather than being related to movement..  
Traditionally, posture is examined in standing and sitting position, but posture should be examined in numerous, particularly posture in which the patient frequently assumes and position related to frequently performed movt. For ex - Standing on one leg is 85% of gait cycle and therefore should be considered a typical posture to be examined.

# INTRODUCTION

- Posture and body shape go hand in hand. In case no attention is paid to posture, human body is likely to suffer from many deformities. And a deformed body is unwanted shape which is not very inviting. From the very beginning, proper attention should be paid to the children's posture while they are sitting, standing, reaching or writing. This is so because the growth and development of the physical shape of the body will have much to do with the postural habits of individual children.

## **CONCEPT OF POSTURE**

**As per Committee of the American Academy of orthopedic surgeons-**

**Posture is defined as the relative arrangement of the parts of the body.**

**WHITMAN(1924);** describe man's erect posture as a constant struggle against the force of gravity.

- In other words, "**Posture concerns the way a persons carries himself while standing, walking or sitting.**
- A **good posture** is that in which the body part is held straight without any strain, with its weight equally distributed over the legs and feet. The chest is held out with shoulders down and back.

## **DEFINITION**

- **Inactive posture**
- **Active posture**

- ✓ STATIC
- ✓ DYNAMIC

## **CLASSIFICATION OF POSTURE**

- Postural control, which can be either static or dynamic, refers to a person's ability to maintain stability of the body's structural equilibrium.
- **According to HORAK**, the ability to maintain stability in the erect standing posture is a skill that the CNS learns using information from passive biomechanical elements, sensory systems and muscles. The CNS interprets and organizes input from the various structures and systems and selects response.

## **POSTURAL MECHANISM**

- **MUSCLE TONE** :The continuous state of tension developed in the muscle is known as muscle tone. The muscle tone is purely a reflex process. This reflex is a spinal segmental reflex. It is produced by continual synchronous discharge of motor impulses from the ant. horn cells of the spinal cord.
- **STRETCH REFLEX** :The basic reflex involved in the maintenance of posture is the stretch reflex. When a muscle is stretched, it responds by contracting. This is called stretch reflex. It is also called a **myotonic reflex** . This reflex is present and serve particular to maintain the body in an upright position.

## BASIC PHENOMENA OF POSTURE

- The main characteristic of CP is abnormal postural tone. If the child's postural tone is normal, she will have enough tension and readiness in her muscles to allow her to hold herself in a wide range of positions even where gravity might her to fall.

The various type of CP are-

✓ severely spastic or moderately spastic CP

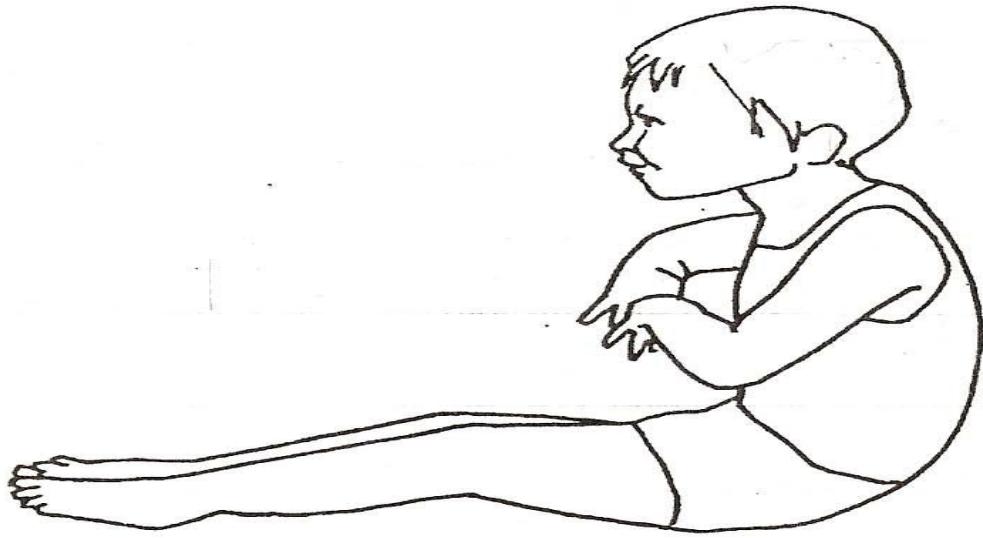
## **POSTURAL ABNORMALITIES**

**IN CP** ✓ ataxic CP

✓ flaccid CP

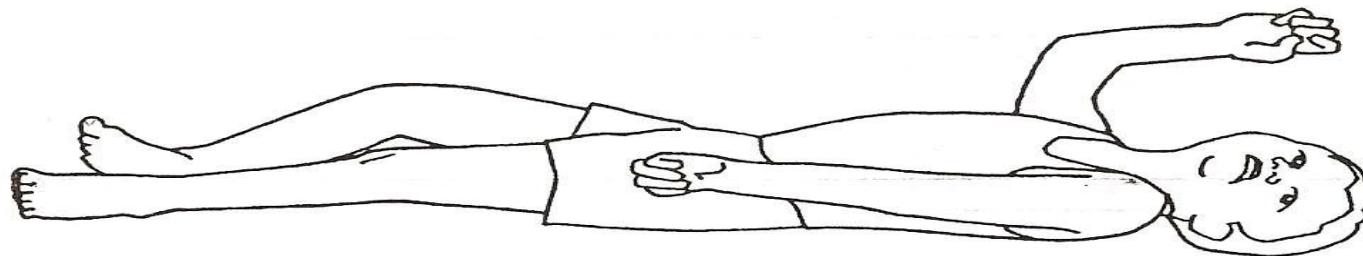
✓ mixed type CP

- In supine , extensor posture , scissoring at the hips, and the planterflexion at the ankle indicate spasticity. This pattern becomes more pronounced in vertical suspension and the wt. bearing. The diagnosis of the lower extremity spasticity is definitely confirmed when the postural response can be consistently elicited on lifting the child into vertical position.
- A child who cannot actively extend her hip when placed in standing likely to hyperextend her knee and extend her lumbar spine to compensate. This causes a lordosis deformity.
- Child may develop a kyphosis to compensate for a lordosis,or due to flexor spasticity of trunk.child with spasticity placed in prone try to lift head,but because the flexion pattern always predominant in prone his flexor spasticity increases. This



**Figure 2.5**

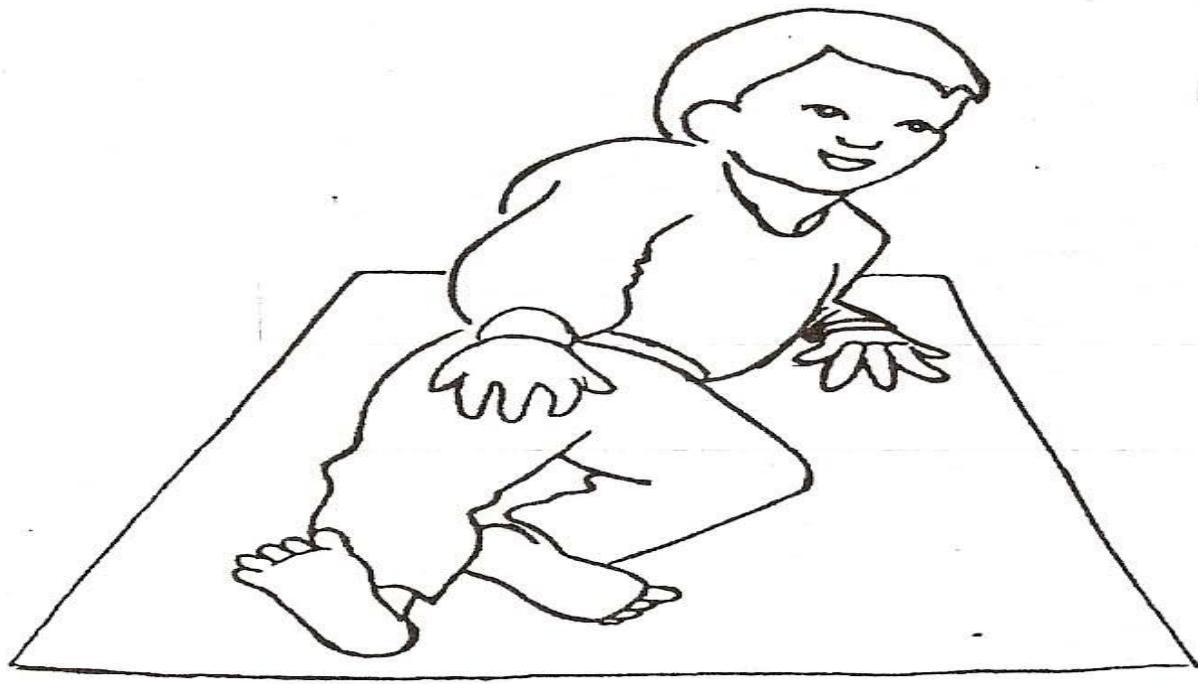
A child who cannot flex well enough at his hips sits back on his sacrum when his knees are straight, and has to compensate with a good deal of flexion in his upper trunk. This makes his arms flex more.



**Figure 2.6**

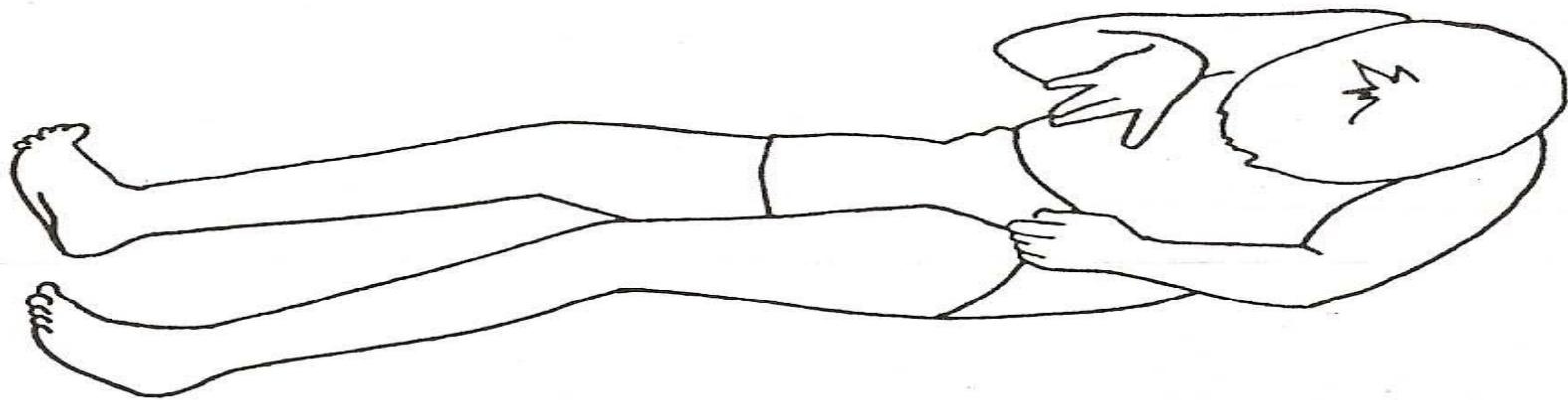
This child shows asymmetry and he is pushing back into extension.

- Fluctuating tone has great difficulty holding her trunk and head erect and if proper care is not taken leads to scoliosis
- In predominantly flexed child, we see fairly symmetrical position but there is more side flexion in one side of the trunk than other, and pelvis retracted on that side.
- Children with severe spasticity, the tone is higher proximally than distally, so 1st objective is to reduce tone in the trunk, pelvis and shoulder girdle.
- In flexed child, the danger of contracture is great so, use every position and situation to get the child extended. Use gravity to help you, once you have got the child extended position, use key points to facilitate him to actively extend and abduct his limbs in wide range of movement and



**Figure 2.14**

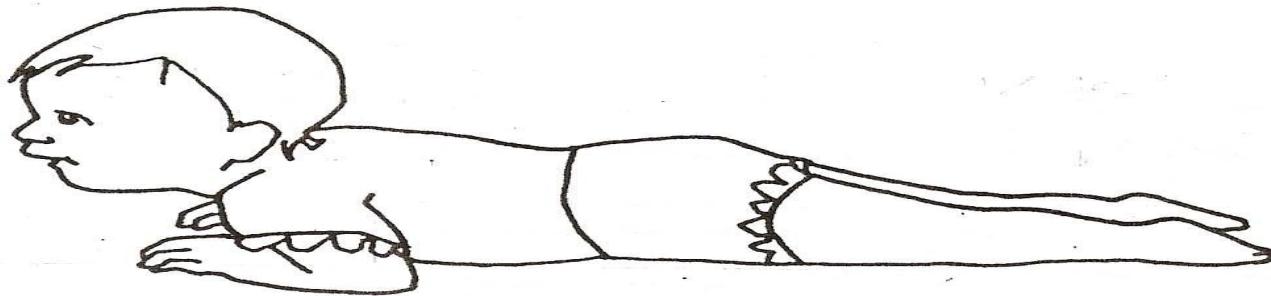
Normal coming up to sitting, with weight bearing on one arm and rotation in trunk.



**Figure 2.15**

Failure to come to sitting because no weight bearing on arm,  
no rotation in trunk and not enough hip flexion.

- Development of asymmetrical movt. in CP gives rise to problem in sitting.
- Active movt. disturb balance and the body falls to the side of movt. as the individual is unable to recover alingment, the posture is maintained.
- Problem is address by giving maximum trunk support ,with particular attention directed to control at shoulder level on the side of movt.



**Figure 2.8**

A child with flexor spasticity in prone can only just lift her head.



**Figure 2.9**

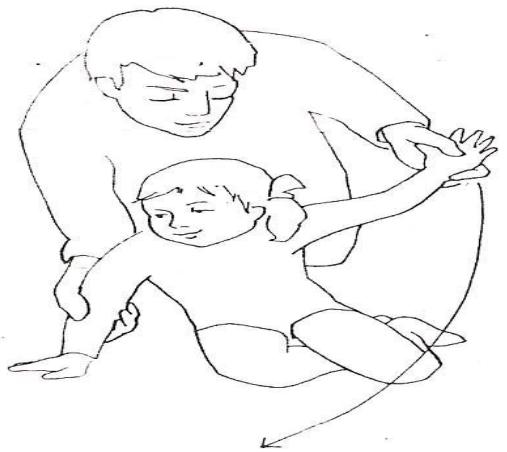
This child shows asymmetry with abnormal pattern of flexion, adduction and inward rotation of the hips, and plantarflexion\* of the feet. The arms are in abnormal flexion, inward rotation and pronation.

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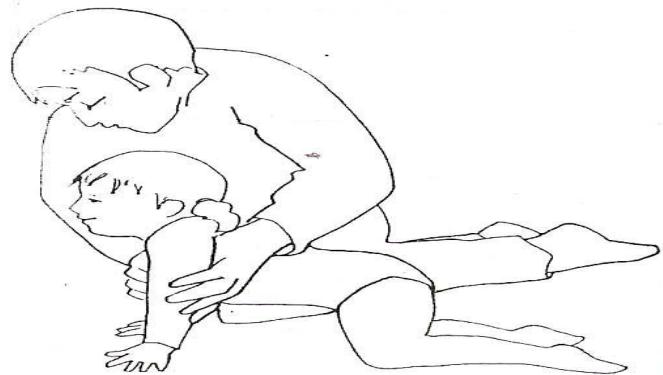
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# MANAGEMENT

- We have seen that by using position, we can not only reduce a child's spasticity but also facilitating more normal posture and movements.the way we touch and move the child will have a powerful effect, so we must make sure that this effect is good.
- It helps to know that just through one point at any one time ,we can control ,change and guide postures, tone and patterns of movt. in other part of child's body. These points are called **key points of control**.
- They are the points where we place our hands in order to stimulate the child's as well as to reduce his spasticity and to facilitate normal postures and movements. Key point can be proximal or distal.Proximal key point facilitate more activity distally. Distal key points work only if the the child has some postural control proximity.



Therapist facilitates child to take weight on her right arm. He uses abduction and outward rotation of left arm to reduce spasticity, and from this point rotates the trunk against the weight-bearing arm.



It is then quite easy to place her weight-bearing through two outstretched arms. He can later take her back to side-sitting so that she gets the experience of changing her position from side-sitting to crawling and back.

- In the case of a child with spastic diplegia ,the therapist would be using a proximal key point if she places her hands on the child's upper legs while in standing. With her hands in this position, she can use her thumbs to facilitate extension ,and her fingers to turn the child's hip into outward rotation. Her hands can also tip the child 's body weight forward to get good alignment in the lower limb, pelvis, trunk.
- A distal key point would be in a child with hemiplegia where the therapist uses the child's hand , in particular, the base of the thumb on the hemiplegic side, to inhibit the abnormal pattern of movement in the whole arm.
- The most commonly used proximal key points of control are head, spine, sternum, shoulder girdle and hips and pelvis. The most commonly used distal key points of control are the jaw, wrist, knees, fingers, jaw, base of thumb, ankle and big toes.

What should we do with our hands when they are placed on the chosen key point of control?

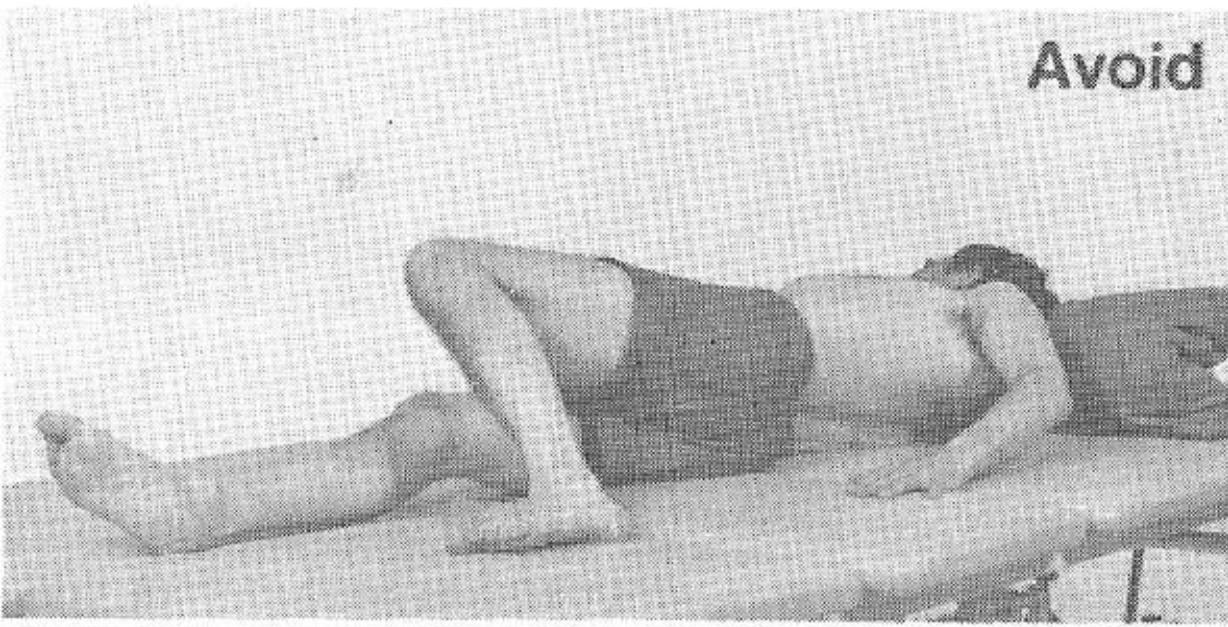
1. keep clearly in your mind the elements of the posture or movement you are working for. Keep using the key point of control in such a way that the child becomes active. Remember, the child is learning a whole new posture or movt. by feeling it happen in his body.if he starts to be able to do for himself the activity you are helping him with, you will feel him become light to your tough. You can then withdraw your support until he needs it again.
- 2 .Move the child to reduce spasticity. Fairly slow movt. in a small range in the trunk, shoulder girdle and pelvis will reduce spasticity proximally.once the tone in the proximal parts is reduced, you must use key points for wide ranges of movt. in the limbs and trunk.
- 3 .Use your hand to support the child in the positions that will be useful for him while stimulating him to be active in other parts of the body

Child prone, head and neck extended, shoulder girdle retracted.	Facilitates extension in rest of the body.
Child supine, head and neck flexed, shoulder girdle protracted.	Reduces extensor spasticity.
Inward rotation of shoulder with protraction of shoulder girdle.	Reduces extensor spasticity, but increases flexor spasticity in neck, trunk and lower limbs.
Outward rotation of shoulder with supination and elbow extension.	Reduces flexion, increases extension in the rest of the body.
Extension of arms backwards in prone, sitting or standing with spine extended.	Reduces flexor spasticity.
In sitting, prone or standing, abduction of thumb with arm in outward rotation and supination.	facilitates opening of finger.
Outward rotation of legs in extension.	Facilitate abduction of hips and dorsiflexion of ankle.

## Use of key points of control

- ABNORMALITIES SEEN IN ROLLING POSITION
- ABNORMALITIES IN MOVING BETWEEN LYING AND SITTING
- STABLE SITTING POSTURE ABNORMALITIES
- SIT- TO-STAND MANEUVER ABNORMALITIES
- STABLE STANDING POSTURE ABNORMALITIES.

# ABNORMALITIES SEEN IN ROLLING

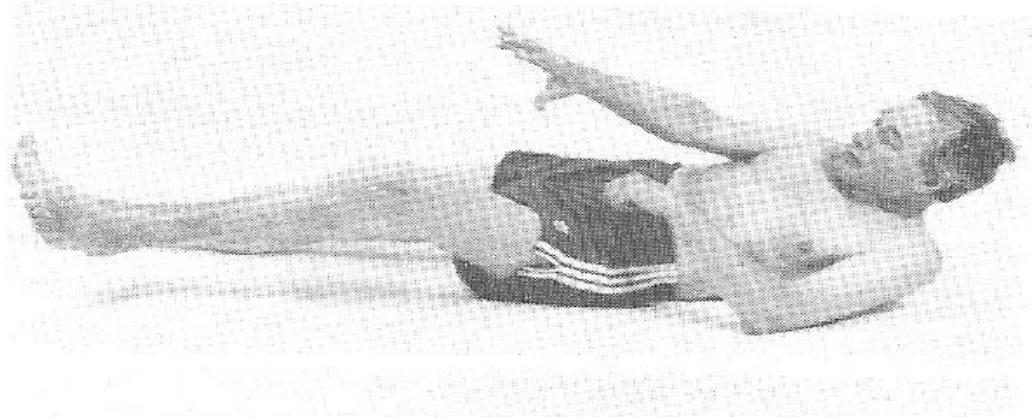


**Fig. 4.15.** Patient demonstrating typical pattern for rolling over, using extension of the sound side (right hemiplegia)

- Due to loss of active flexor control of the trunk, patients will usually roll over to prone position in an extensor pattern, starting the movement by pushing off with their sound leg and arm.

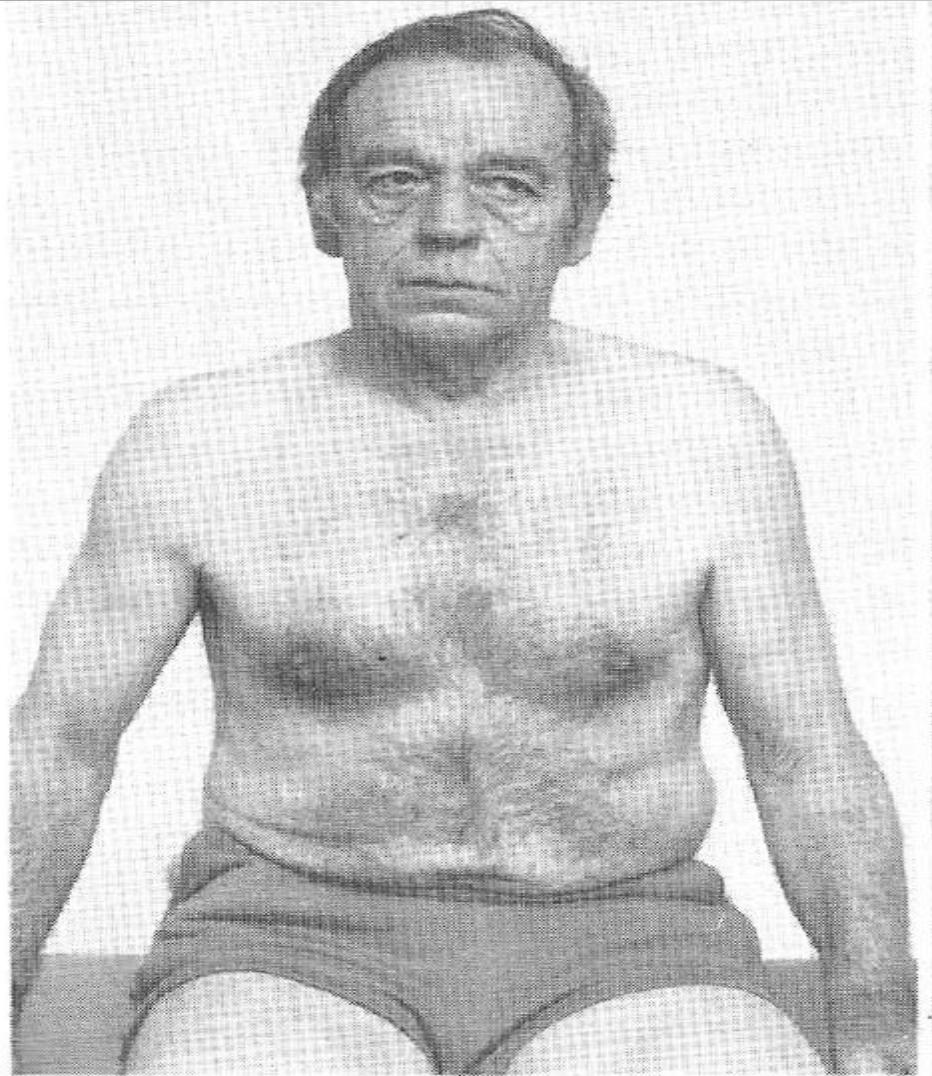
# ABNORMALITIES IN MOVING BETWEEN LYING TO SITTING

## The Most Commonly Observed Problems



Even when rotating towards the hemiplegic side the patient is unable to sit up, and he cannot extend his hemiplegic leg while the trunk is flexing (left hemiplegia).

- From a supine position , however, many patients are unable to come up to a sitting position unaided.
- When the patient sits up with the therapist helping by holding his hands , he raises his arms to be able to use his more effective back extensors. He has difficulty in keeping his affected leg extended on the floor to provide an anchor. Without selective activity between the trunk which is trying to flex and the legs which have to attend actively in order to remain on the floor, the patient can not come up to sitting from lying even with help.
- Even when sitting up with the sound side rotating forwards, the hemiplegic legs tends to flex despite the patient's conscious effort to maintain knee extension and keep the foot on the supporting surface.



3.3

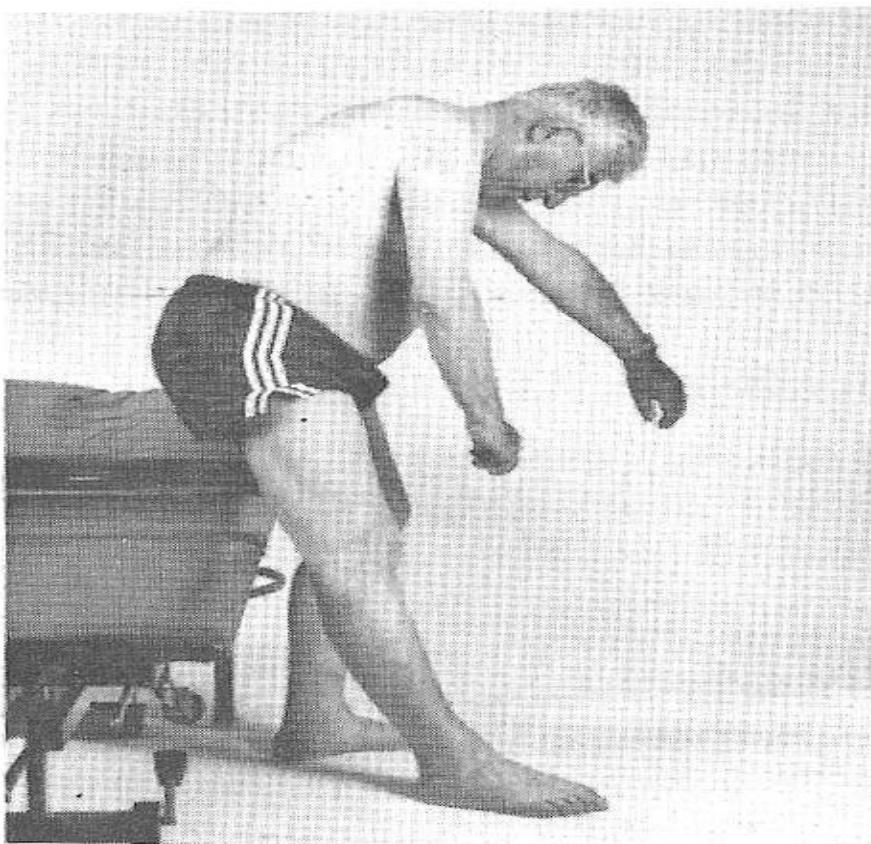
The lateral wall of the abdomen bulges on the affected side with a loss of the waist contour(left hemiplegia)

## **EN IN SITTING**

- When assessing stable sitting postures, look for the patient's ability to sit, unsupported in a symmetrical posture for a period of time. Patients with generalized weakness may be unable to maintain a sitting posture without the therapist 's support
- The posture of this patient is generally slumped forward, and a posterior pelvic tilt is evident. The patient with hemiplegia may have an asymmetrical sitting posture in which the involved shoulder is depressed and a posterior pelvic tilt is evident. Although the patient may be able to maintain this position prolonged sitting in this position contributes to postural abnormalities and muscle imbalance.

# ABNORMALITIES SEEN SIT- TO-STAND MANEUVER

Standing Up from Sitting



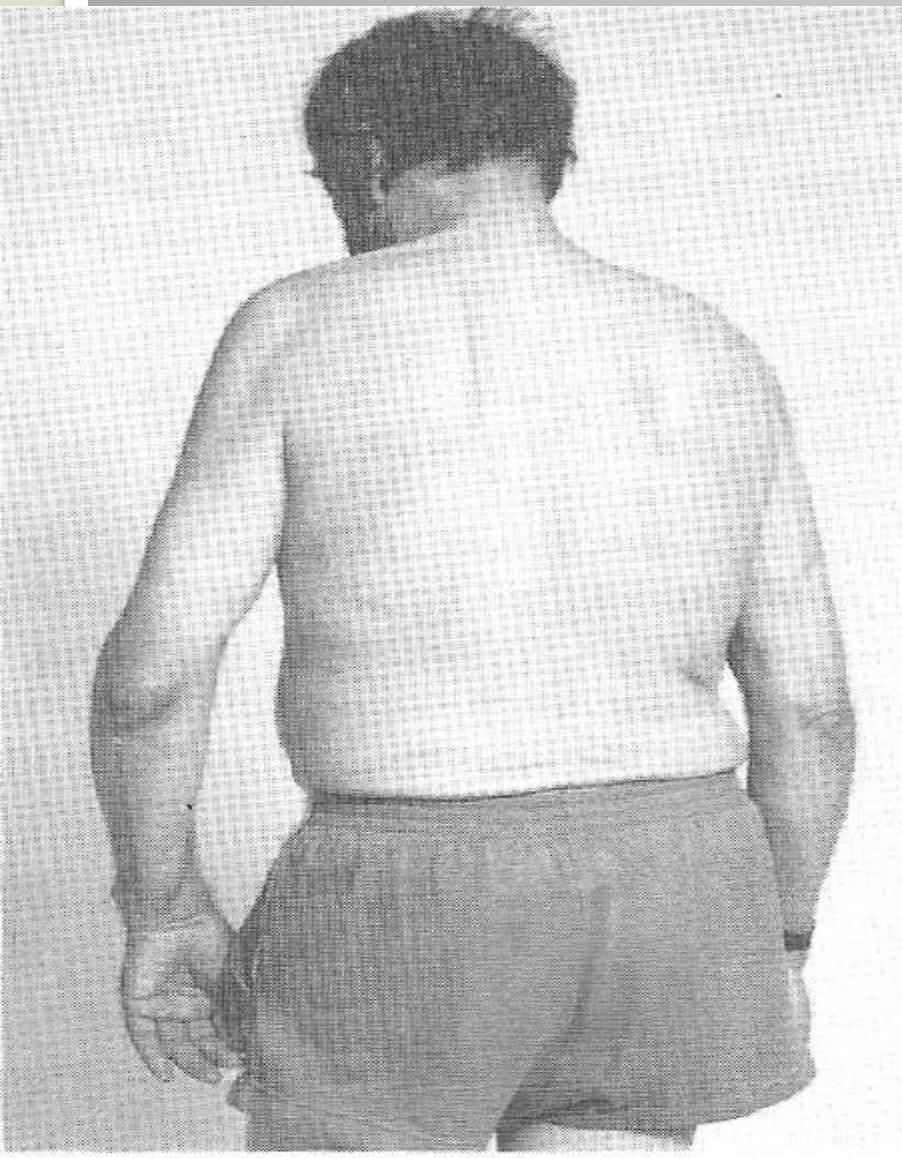
**Fig. 7.5.** A patient stands up incorrectly using the total mass pattern of extension of his leg, which prevents his weight from being brought far enough forwards (right hemiplegia)

The biomechanics of moving from a sitting to a standing position have been

documented. **There are 4 phases in this sequences-**

**1. flexion momentum 2.Early lift 3.Extension  
4.stabilization**

- Patient have difficulty in standing up from sitting in a normal way as the movement requires selective activity of the trunk and the legs simultaneously. Normally when we stand up, the extended trunk is brought forward so that our head is over our feet or even further.
- As the trunk moves forward the extensor muscles of the hips and knees are active, and then as our seat leaves the supporting surfaces the knees move forward over our feet at first. The ankles are therefore required to dorsiflex further, even though there is increased activity in the hip and knee extensors.
- Standing up from sitting is very important activity for the patient because if he does so in an abnormal way he will be reinforcing a mass movement synergy, and through constant repetition extensor spasticity in his leg will be



In upright position the distance from the vertebral column to the lateral border of the trunk is increased on the affected side  
(Left hemiplegia)

**SEEN IN  
JRE**

- Patient with hemiplegia often stand asymmetrically with the involved shoulder depressed, which the noninvolved upper extremity is supported by parallel bar or another assistive devices. Asymmetrical wt. bearing through the noninvolved UE in wt. bearing contributes to a shift in the COG towards the noninvolved side
- Standing may maintain by the assumption of an asymmetrical posture that incorporates UE support. However, prolonged standing in this position contributes to the development of postural abnormalities and muscle imbalances

## The three most common difficulties for the patient are-

1. He cannot extend this trunk when his hips are flexed,nor flex his hip sufficiently while extensors activities are required.He is therefore not able to bring his weight far enough forward over his feet.
2. The hemiplegic hip adducts because extensor activity is needed, and it is not possible for the patient without the adduction components of the extensor synergy.The heel of the hemiplegic limb may leave the floor,as plantarflexion occurs together with the extension at the knee.
3. Because the patient has been unable to bring his weight far enough forward, and because his hip extensors and plantarflexors are acting simultaneously in the total mass synergy,he pushes back wards in his effort to stand up his knee moving backwards instead of forwards.

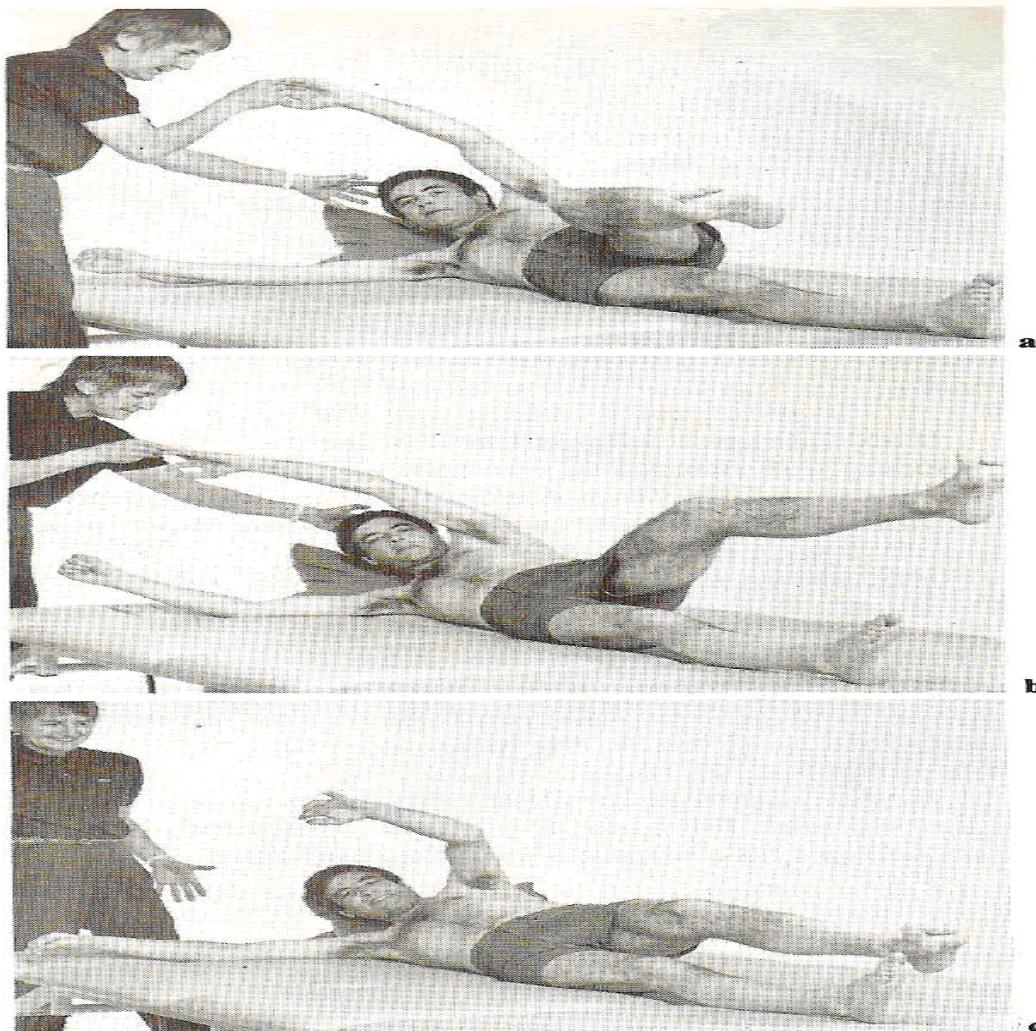
# CORRECTION OF ABNORMAL POSTURE

- PROPER POSITIONING
- VISUAL FEEDBACK.
- AUDITORY FEEDBACK
- SWISS BALL EXERCISE
- MUSCLE STRENGTHNING OF TRUNK MUSCLE.

# **ROLLING**

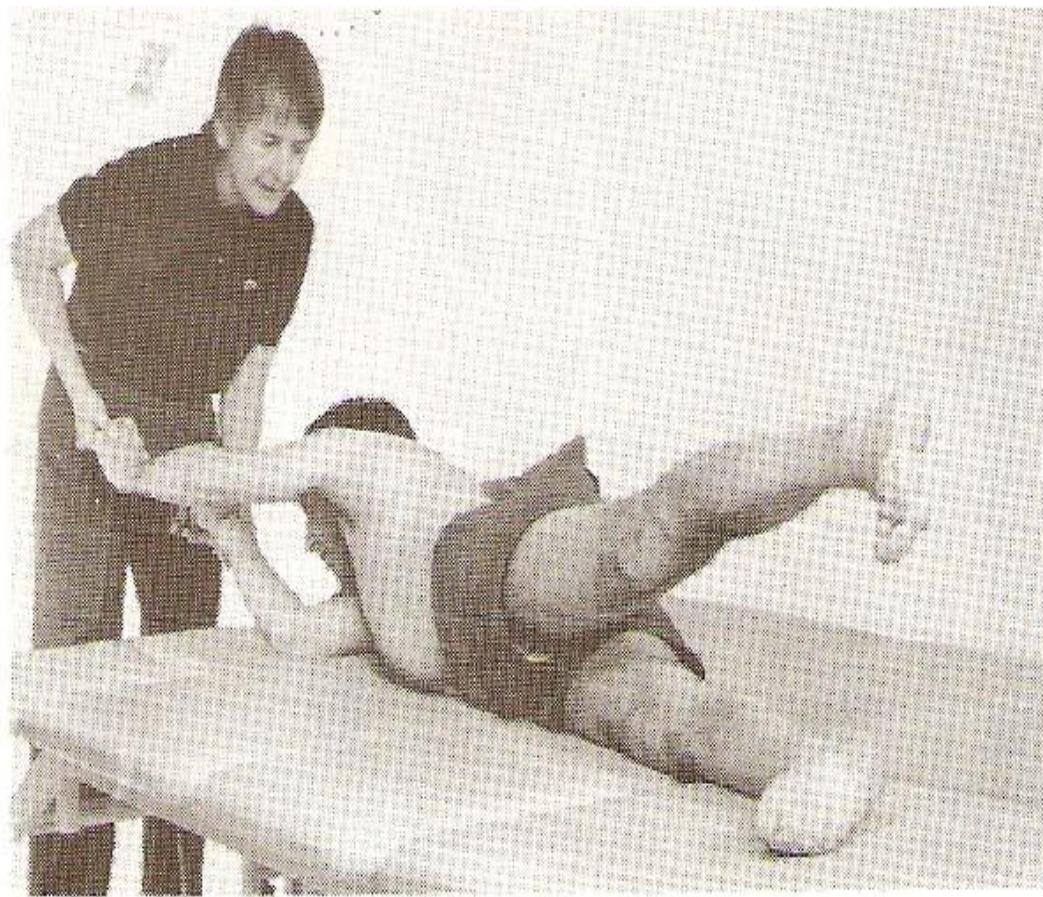
This movement may be limited in patients with diffuse weakness or hemiplegia patient who have generalized weakness throughout their bodies may be unable to accomplish any or a combination of following –

- Lifting the arm forward
- Rotating the head and trunk
- Unilaterally lifting the leg.
- Pushing off from the bed with the heel.



**Fig. 4.18 a–c.** Rolling towards the hemiplegic side with less assistance (right hemiplegia). **a** The patient lifts his head from the pillow, and brings his leg forwards actively and the therapist guides his sound hand. **b** Returning slowly to the supine position with only minimal support. **c** Rolling over unaided. The patient does not allow his hemiplegic arm to pull into flexion

82 Activities in Lying



**Fig. 4.19.** Rolling right over to prone

- Active rolling from a supine position to lying on the side and back again using active flexion of trunk can be facilitated and used to improve trunk control for patients in all stages of their rehabilitation.
- The movement should be performed first towards the hemiplegic side. The tone in the hemiplegic side is thus inhibited by the rotation of the trunk and allows the movement to take place more freely to the other side afterwards.
- Patient with hemiplegia may be able to roll to the involved side with the noninvolved upper extremity pulling the body over to a side -lying position. Rolling to the noninvolved side may be difficult if the patient is unable to protract the involved

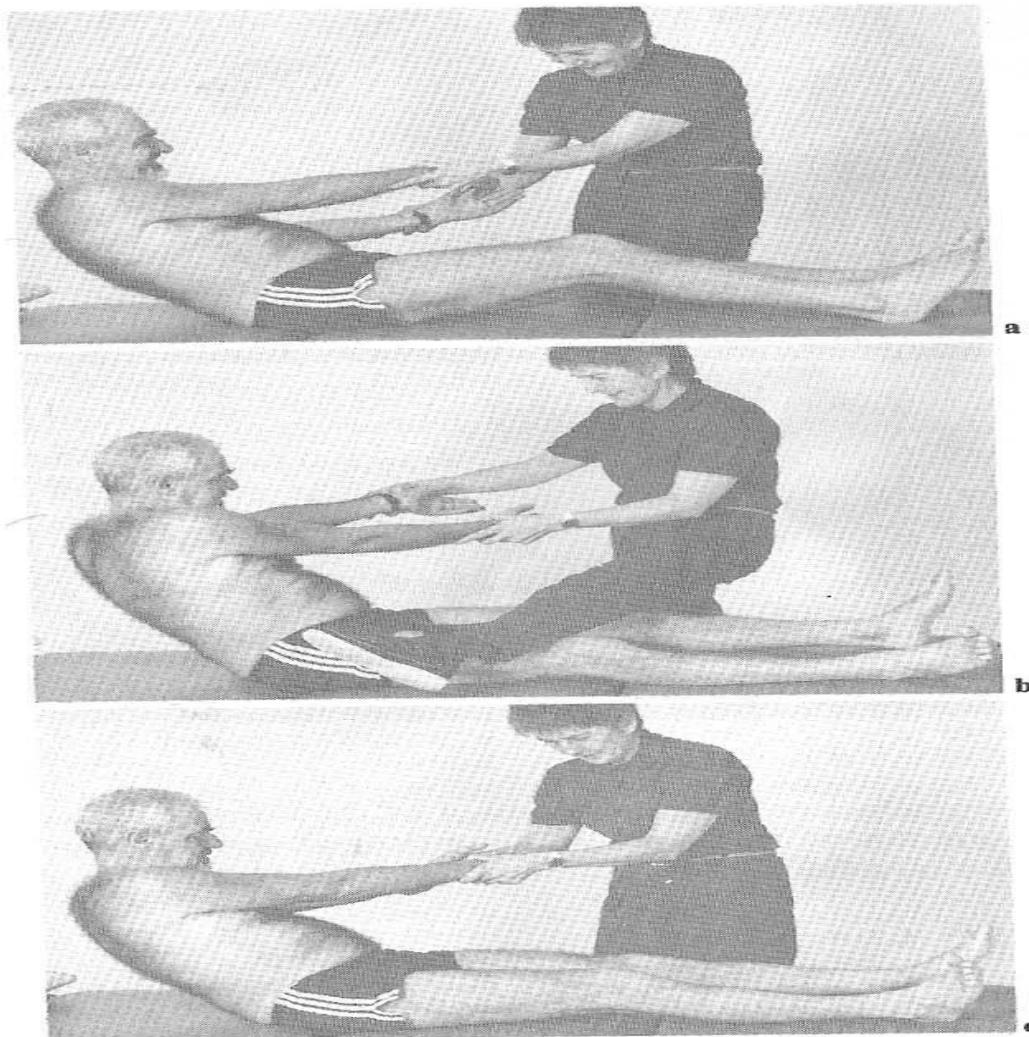
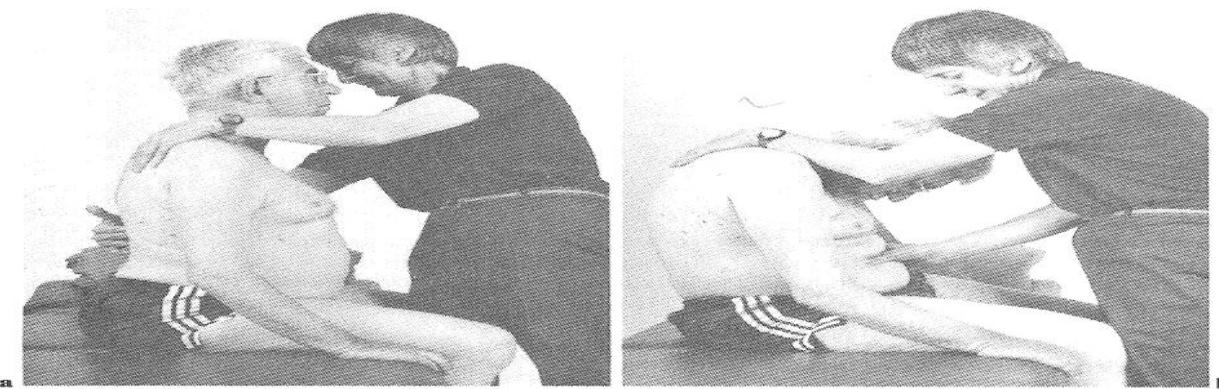
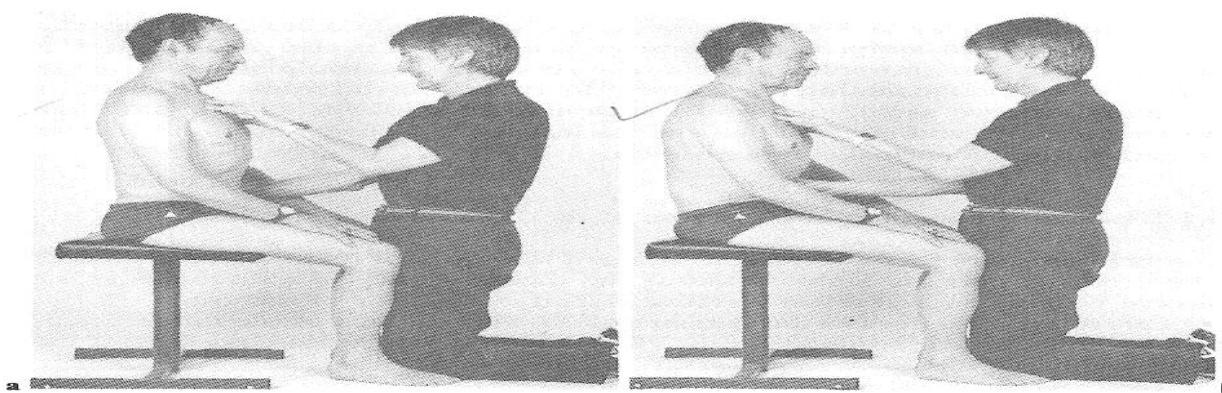


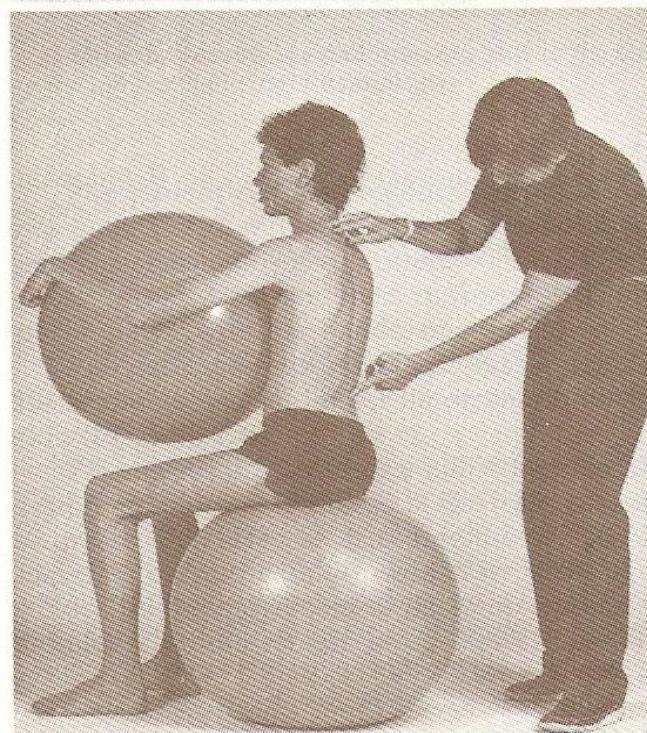
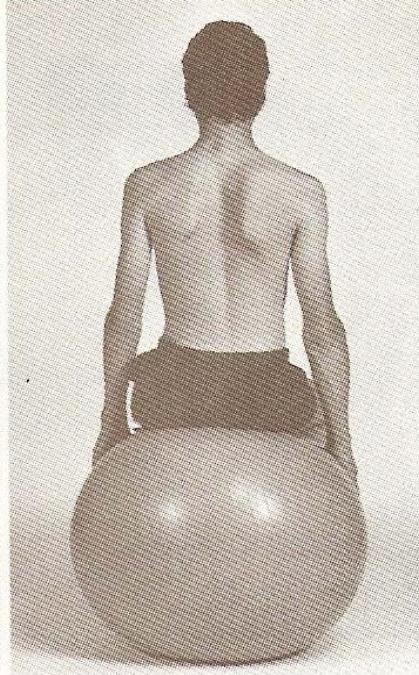
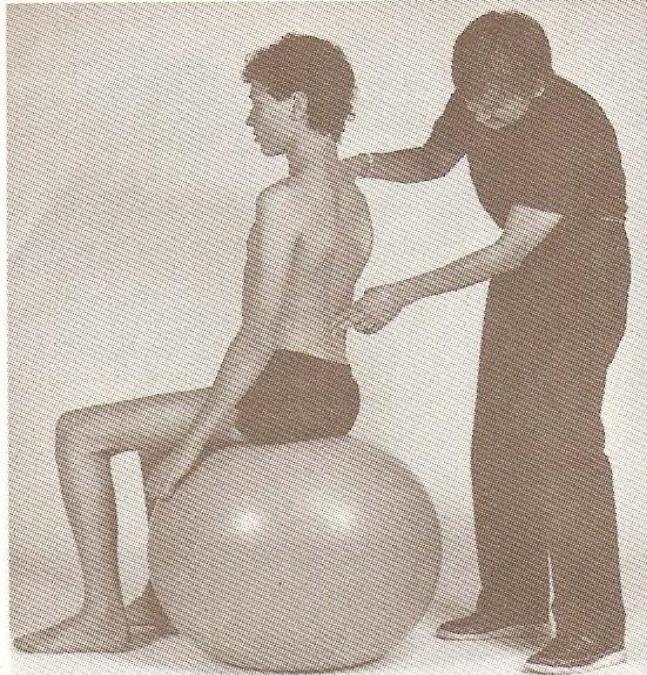
Fig. 5.12 a-c. Moving the trunk backwards in long sitting with rotation towards the sound side (right hemiplegia). a The patient has difficulty in bringing his affected shoulder forwards, and his hemiplegic leg tends to flex. b The therapist helps to keep the patient's leg in extension and holds his arms in the correct position. c The patient maintains the extension of his leg actively as he moves further and further towards lying and back up again.



**Fig. 6.1 a, b.** Flexing and extending the trunk to correct the position of the pelvis (right hemiplegia). **a** Extension. **b** Flexion



**Fig. 6.2 a, b.** Selective movement of the lower trunk with stabilisation of the thoracic spine (right hemiplegia). **a** Extension. **b** Flexion



Holding a ball in both arm to correct the position of the thoracic spine and scapula (Right Hemiplegia)

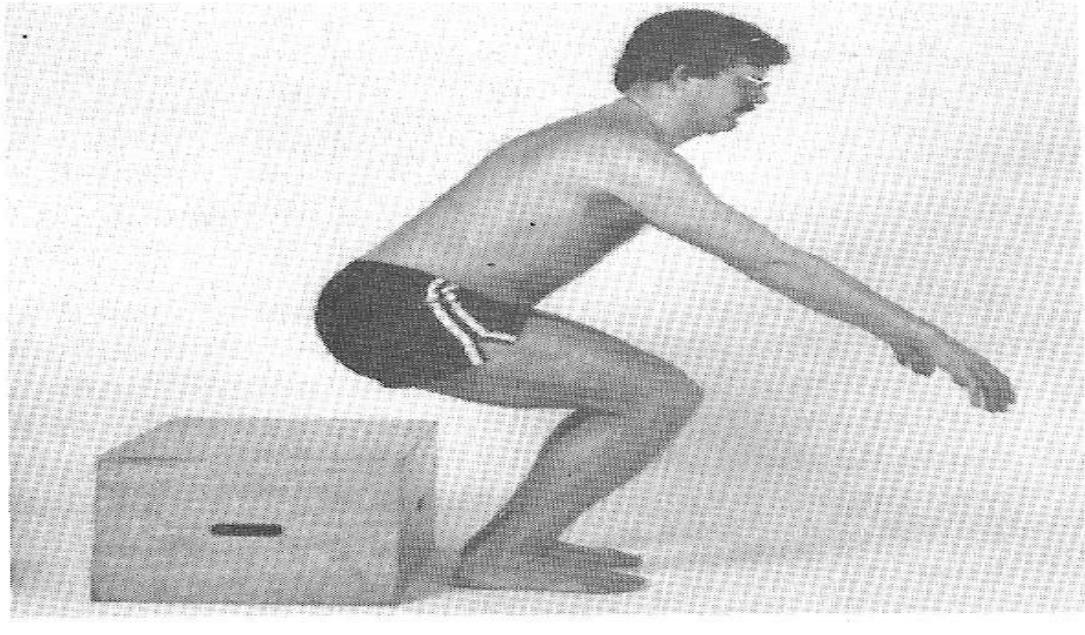
a. Winging of scapulae

b. Over active extension of the thoracic spine

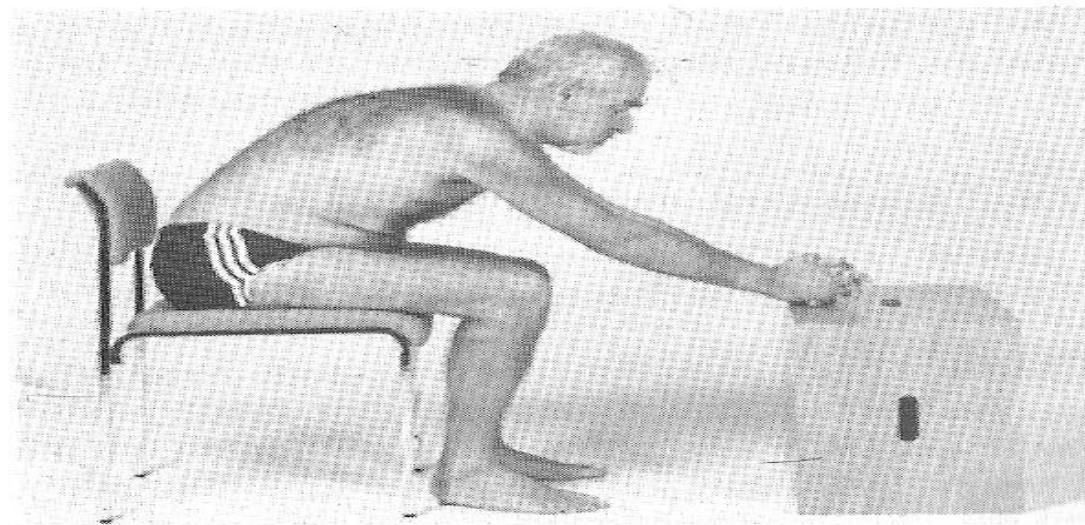
c. Scapulae in corrected position

d. Normal kyphosis of thoracic spine

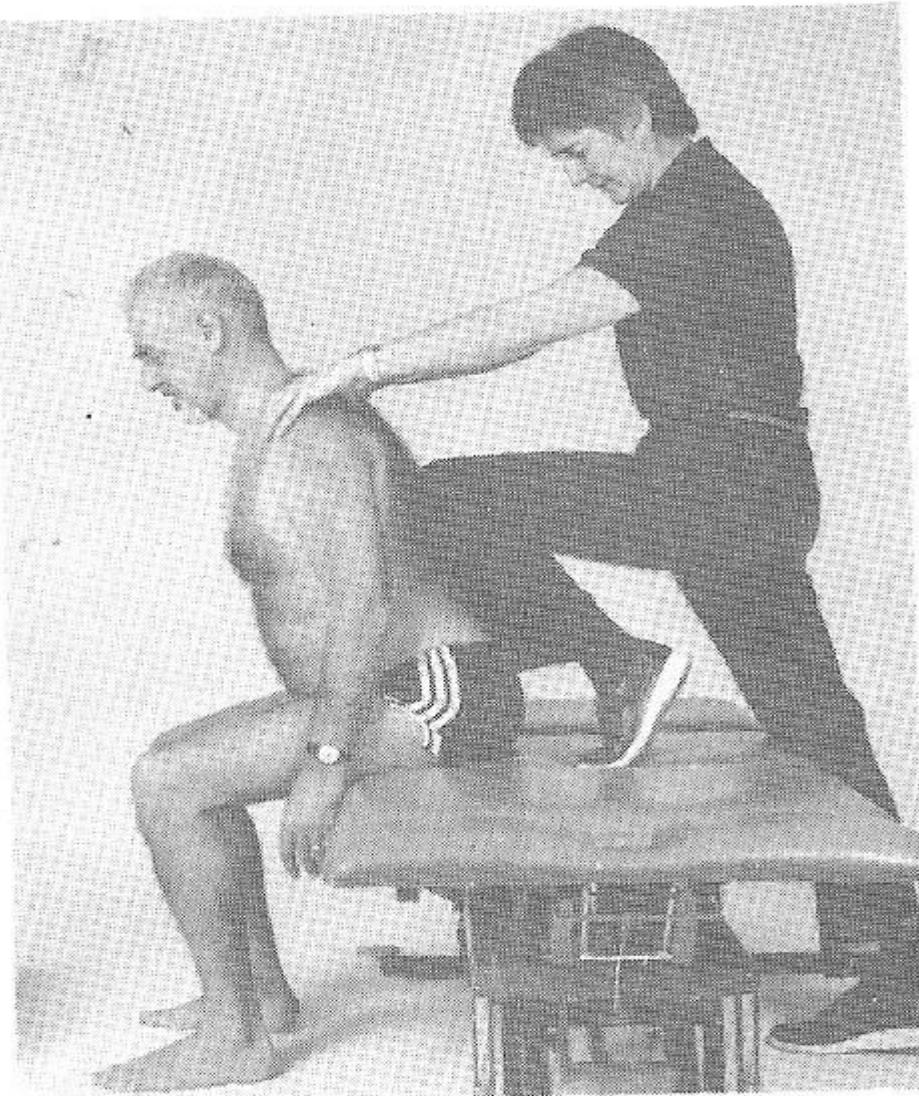
**Fig. 7.3.** The arms extend actively only if the seat is very low (normal model)



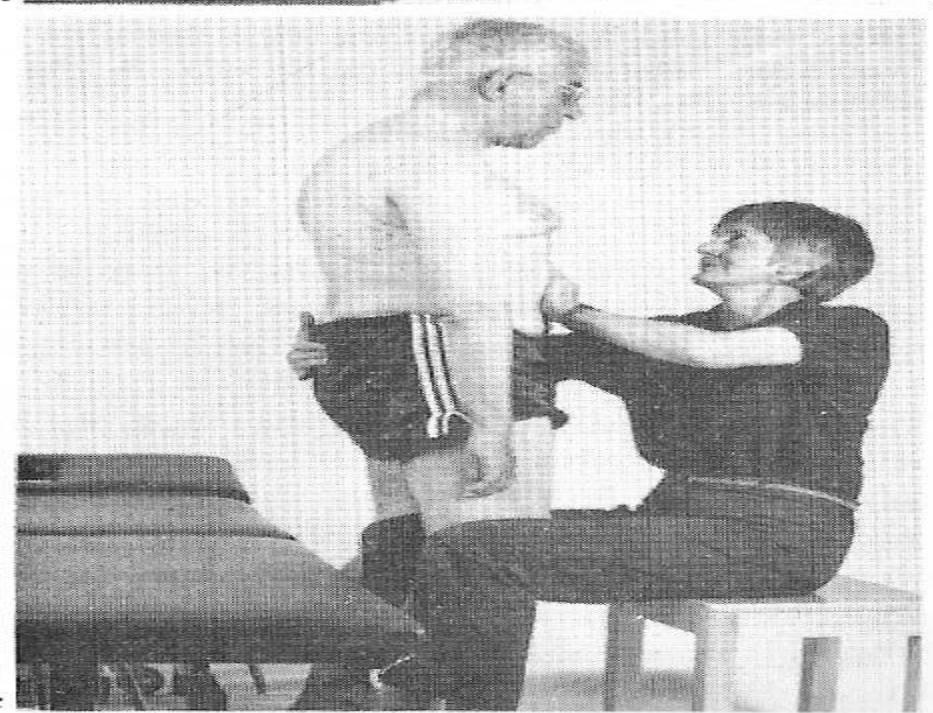
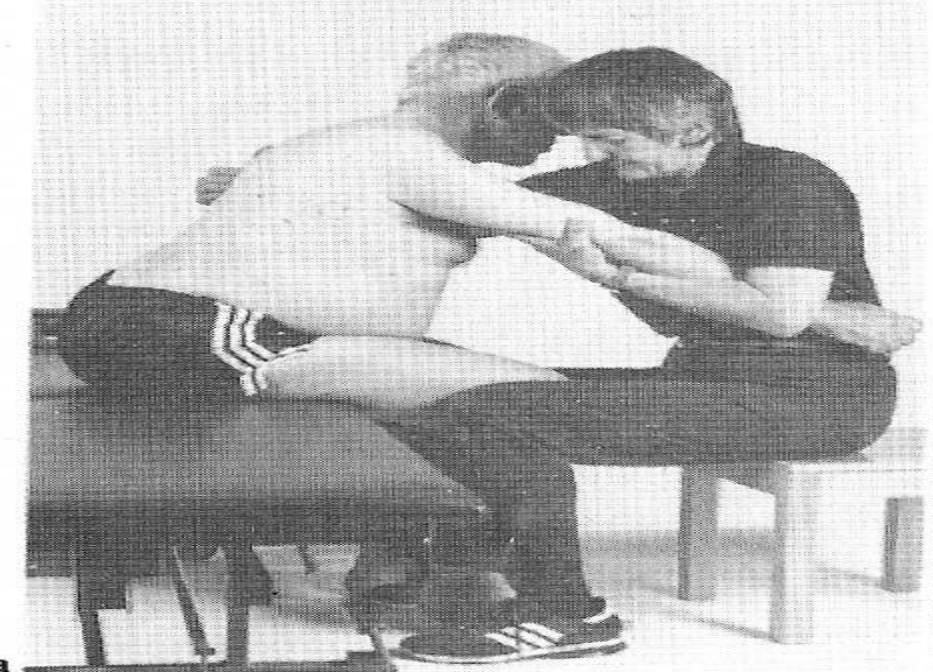
**Fig. 7.4.** The patient has difficulty in extending his trunk when his hips are flexed and in flexing his hips when extensor activity is required (right hemiplegia)



## Standing Up from Sitting



**Fig. 7.8.** Facilitating trunk extension as the patient leans forwards (right hemiparesia)



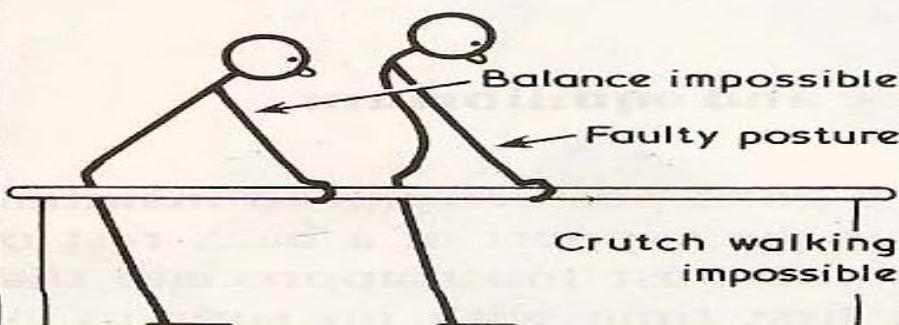
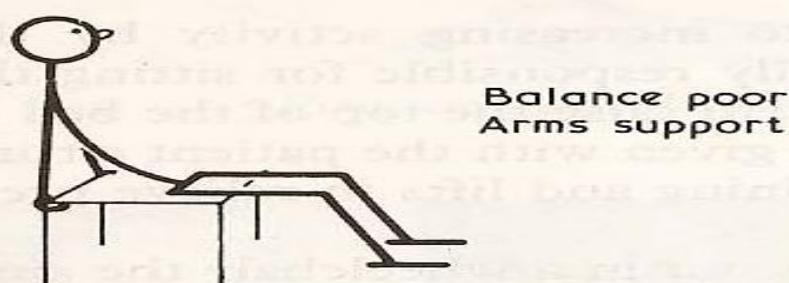
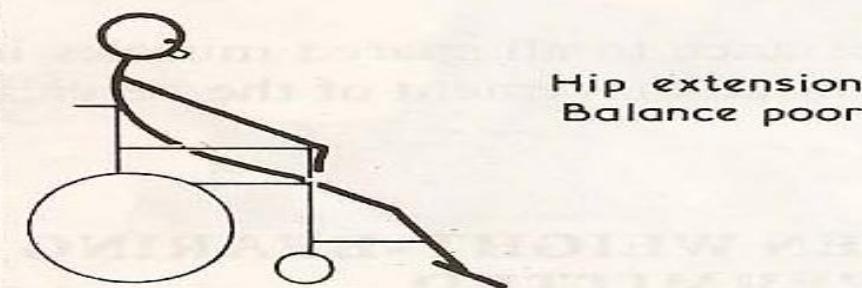
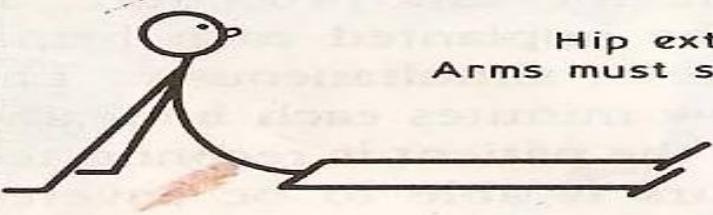
**Fig. 7.12 a-c.** Facilitating the activity of standing up from sitting (right hemiplegia). **a** The therapist holds the patient's hemiplegic knee between hers and supports his affected arm. **b** She draws his knee forward over his foot and assists trunk extension. **c** She adjusts the position of his pelvis

# POSTURAL ABNORMALITY IN SCI

- Patient with quadriplegia require at least 100 degree of straight-leg ROM to assume a long –sitting position. without this available motion hamstring tension will cause a posterior tilting of the pelvis. This will result in the patient's sitting on the sacrum,with resultant stretching of the lower back musculature.
- Sitting posture will vary considerably with lesion level. Patient with low thoracic lesions can be expected to sit with a relatively erect trunk. Individual with low cervical and high thoracic lesion will maintain sitting balance by forward head displacement and trunk flexion . Patient with high cervical lesion will demonstrate poor sitting posture.

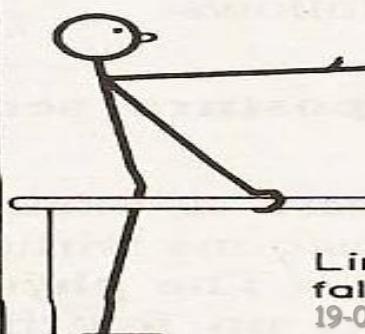
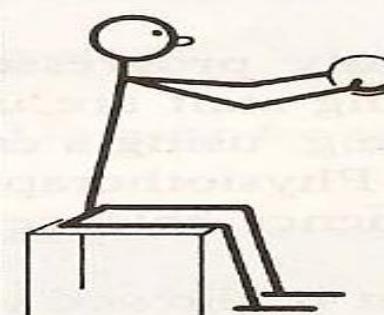
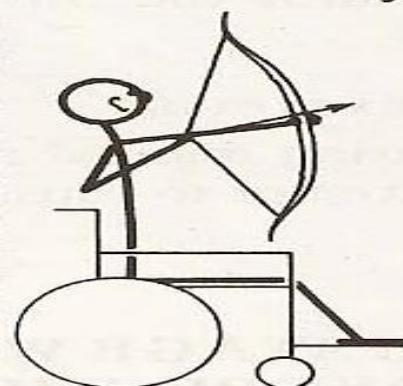
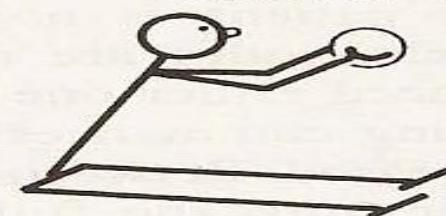
### FAULTY POSITIONS

Hip extension  
Arms must support



### CORRECT POSITIONS

Spine straight  
Hip flexion  
Arms free



Line of gravity  
falls within base  
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- Insufficient hip flexion to get the weight of the trunk well over the feet is another fault of sitting posture.
- In all but the most mild cases some residual flaccid paralysis of the hands will make manipulative skill difficult or impossible. this factor with the added problem of imperfect control of the spastic trunk and lower limbs.

- To attempt sitting, the patient ,initially over the bed,presented tremendous problems in that it was impossible to bring trunk and pelvis forwards over the hips. This enforced posture at the hips with the pelvis in position of post. Pelvic tilt. resulted in the patient having to over compensate with flexion of trunk to prevent falling backwards.
- For this reason, active sitting without support was discouraged and a wheelchair provided which accommodated deformity.



➤ **A deficit of posture is recognised in the inability to organised the attitude of the body it is manifest as follow-**

- The body slumps or arches.
- Trunk roll to 1 side ,lateral flexion is accompanied by rotation within the spine.
- Head falls forward,sidewards or backwards depending on the direction of forces acting upon it.

- Trunk leans against back support increasing the tendency to slide,predisposing to frictional damage to the skin
- Body segments buckle and bend, finding their own level of support.
- The tissue are subjected to unequal loading with resultant localised high pressure area.

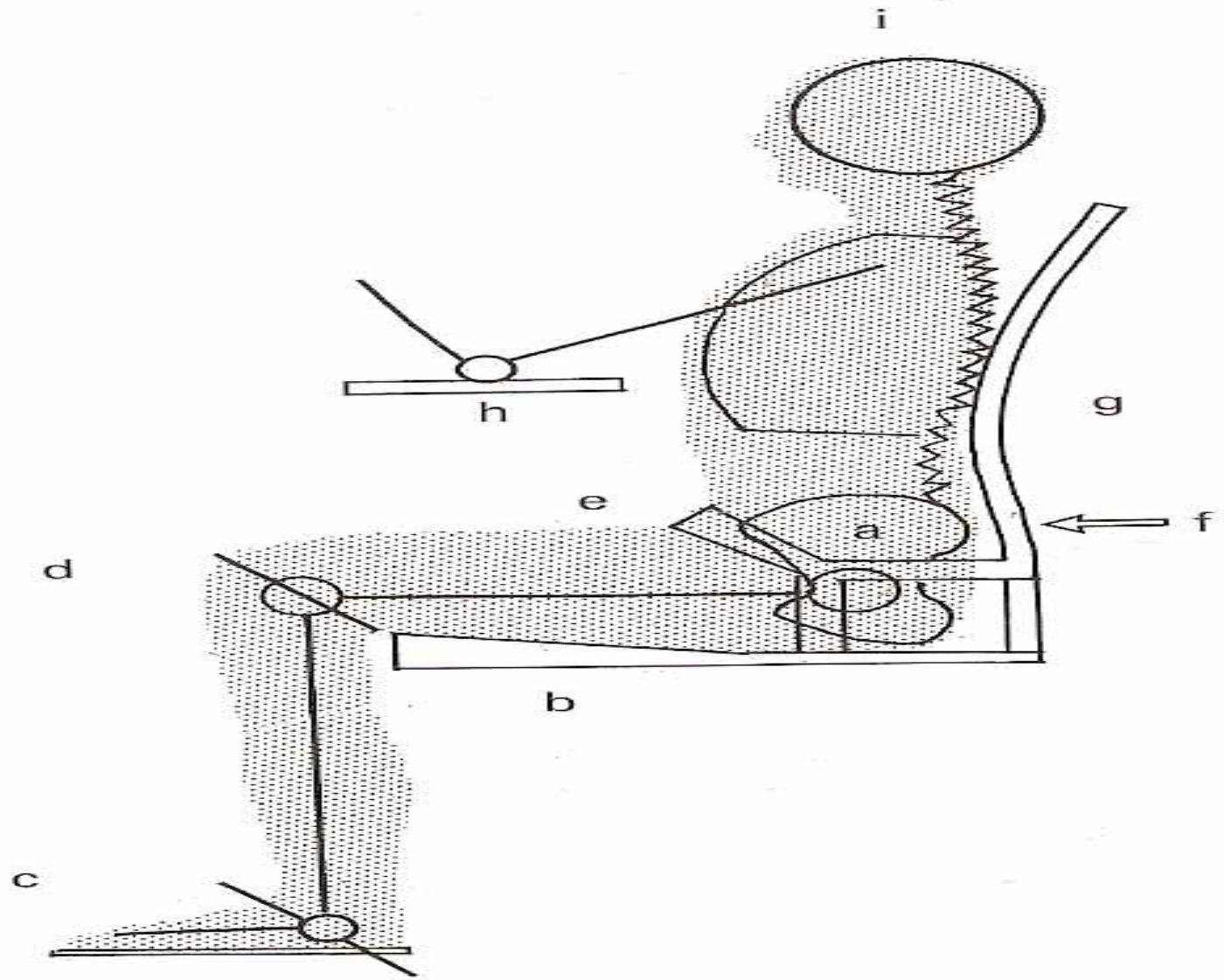
□ Sitting posture are important for various activities in daily life like ADL , transfer, dressing, wheel chair mobility etc.sitting is achieved easily by paraplegics but it is difficult job for quadriceps.

- Stability in sitting position is achieved by wt. bearing through heads with flexed fingers, extended wrist, extended elbow and hyperextended and externally rotated shoulder.

## **MANAGEMENT OF THE POSTURAL ABNORMALITIES IN SCI**

- Postural correction and balance is trained with the patient sitting on a pillow on a low plinth .The feet should be supported on the floor or a low platform so that the thigh are fully supported and hip,knee and ankle are at right angle with leg in slight abduction gives a major stability to trunk.
- Patient with spasticity taught modified cross sitting .ie, hip flexed,laterally rotated and abducted ,knee flexed,sole of the feet are in contact.this accompanied by posture of erect spine,not a rounded spine in sitting position.

- In treatment of SCI patient, trunk mobilisation refer to movt. of trunk, facilitated by the therapist, which are used to modify abnormal tone and improve alignment.
- The seating system is a static system that is used to align and maintain the appropriate posture to improve function.

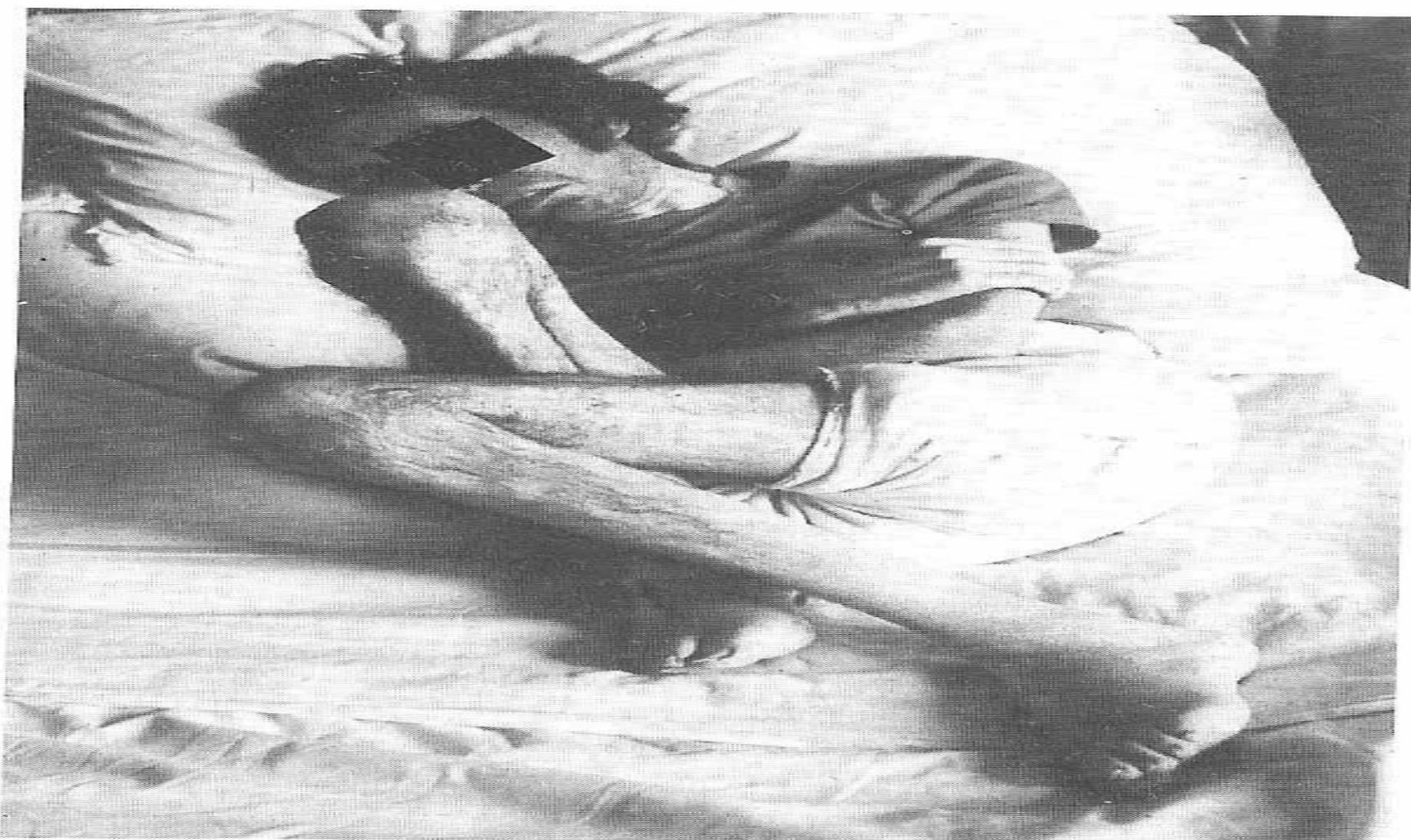


**Figure 9.14** (a) Position of the pelvis; (b) accommodating the shape of the thigh; (c) feet in plantigrade, with control if necessary; (d) knees flexed and separated; (e) Y-shaped pelvic strap to assist in securing seat position; (f) posterior support for the pelvis directing lumbar curve; (g) profiling of upper and lower trunk segments; (h) support for the upper limbs; (i) head position – slightly posterior to midline.

- **The optimal seated position in wheel chair the achieve following—**
- A level pelvis with a slight anterior tilt.  
Accomodating the shape of thigh.
- Feet in plantigrade,with control if necessary.
- Hip and knee flexed and separated.

- Y -shaped pelvic strap to assist in securing seat position.
- Posterior support for the pelvis directing lumbar curve.
- Profiling of upper and lower trunk segment.
- Support for upper limb.
- Head position –slightly posterior to midline.

- Standing is recommended for all patient with thoracic or cervical lesion. Standing improves the activity of postural muscles of the neck and upper trunk
- When a good standing position is achieved the trunk should be moved, keeping an upright posture, so that weight is transferred from side to side, rocking over foot.



**Figure 9.8** The bedfast state.

- Tissue adaptation ,leading contracture and deformity.
- Tissue breakdown due to necrosis.
- Reduced efficiency of performance.
- Respiratory distress.
- Respiratory / urinary tract infection.
- Discomfort.

# THANK U

