# PAINFUL SHOULDER IN HEMIPLEGIA — PREVENTION AND TREATMENT

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**SUMMARY**

*The painful shoulder which occurs in hemiplegia, is discussed. Possible mechanisms causing the pain, preventative measures based on the neurodevelopmental approach to treatment and therapeutic measures including treatment by means of passive movement, are described.*

**OPSOMMING**

*Die pynlike skouer wat by hemipleë voorkom, word bespreek. Die moontlike meganismes waardeur die pyn veroorsaak kan word, voorkomende maatreëls gebaseer op die neuro-ontwikkelingsbenadering tot behandeling en terapeutiese stappe, insluitende behandeling deur middel van passiewe beweging, word beskryf.*

A painful shoulder is all too often a limiting factor in the rehabilitation of adult hemiplegic patients and yet in the majority of cases this problem should not arise if the patient is handled correctly from the onset of the hemiplegia.

Pain is frequently associated with a subluxation of the glenohumeral joint but is more often due to superimposed trauma than to the subluxation itself. Completely painless subluxations of more than 2,5 cm have been noted in the flaccid stage. Nevertheless, it is evident that prevention of subluxation will contribute to the avoidance of a painful shoulder. In the normal person, inferior subluxation of the glenohumeral joint is prevented by a locking mechanism (Basmajian, 1978) dependent upon the angle of the glenoid fossa. When the subject is in an upright position the scapula is stabilised in slight lateral rotation and the humerus hangs vertically. In this position the superior part of the capsule and the corticohumeral ligament are taut and it is impossible to subluxate the head of the humerous downwards, even when heavy weights are suspended from the arm. The capsule and ligament are supported in this function by activity in supraspinatus and, to a lesser degree, in some of the horizontal, posterior fibres of deltoid. Basmajian (1967) points out, however, that a relative abduction of the humerus to about 15° is sufficient to allow considerable downward subluxation of the head of the humerus.

In the flaccid stage of hemiplegia two factors would appear to interfere with this inherent stability of the glenohumeral joint in the upright position. Firstly, inactivity of the upper fibres of trapezius and of serratus anterior results in medial rotation of the inferior angle of the scapula with consequent downwards angling of the glenoid fossa and relative abduction of the humerus. Secondly, inactivity of supraspinatus and the horizontal fibres of deltoid allows the unopposed weight of the arm to stretch the cortico-humeral ligament and superior capsule. In the absence of any stretch reflex activity in the muscles acting upon the glenohumeral joint, trauma is easily superimposed upon the already subluxed joint, usually by traction on the hemiplegic arm as the patient is moved about in bed or from the bed to a chair.

As spasticity develops, the scapula becomes fixed in retraction and medial rotation due to spasticity in the rhomboids and the lower fibres of trapezius, reinforced by latissimus dorsi. Hypertonus in subscapularis, infraspinatus and teres minor now contributes to the subluxation of the head of the humerus from the downwards tilted glenoid fossa (Bobath, 1978). There is a resistance to protraction and lateral rotation of the scapula and if the arm is moved above the horizontal the capsule and synovium, as well as supraspinatus, are compressed against the acromion process of the scapula. This type of trauma occurred frequently in the days when reciprocal pulley exercises were popular for hemiplegics, and is still seen all to frequently as a result of passive stretching of the glenohumeral joint without adequate prior attention to inhibition of spasticity and mobilisation of the scapula.

Repeated minor trauma resulting from any of the above mechanisms will set up a capsulitis which, unless treated promptly, may progress to the loosely-called "frozen" shoulder. Although treatment at the very first hint of pain is usually effective it is obviously very much better to prevent trauma to the joint in the first place. This may be achieved by correct positioning and handling, prevention of subluxation, inhibition of spasticity (and mobilisation of the scapula) and early re-education of movement.

## POSITIONING AND HANDLING

This involves careful instruction of nursing personnel and counselling of the patient and his family. During the early stages the patient, as far as is possible, should not be nursed supine as this position encourages retraction of the scapula. He should be nursed on each side alternately, with the shoulder girdle protracted and the arm extended forwards in the neutral position (Figs. 1 and 2). When the patient is being turned towards his sound side the affected arm must be fully supported and his arm and upper trunk should be brought forwards by grasping him behind the scapula (Fig. 3) and not by pulling on his arm.

If it is necessary for him to sit in bed, his trunk must be completely upright, his shoulder-girdle protracted and his arm supported forwards on a bed-table or on pillows (Fig. 4). Sitting out in a chair is preferable to sitting in bed, but it is very easy to cause trauma to the shoulder joint if the transfer from bed to chair is clumsily performed. Todd and Davies (1977) give the correct way of performing this manoeuvre, the therapist or nurse supporting under the patient's shoulders with her hands over the scapulae (Figs. 5 and 6). Once out in a chair, the affected arm may be supported forwards either on a table or in a trough attached to the arm of the chair.

Frequently unawareness of, and inattention towards, his affected side causes the patient to leave his arm dangling over the side of the chair without any form

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Received 12 December 1979.

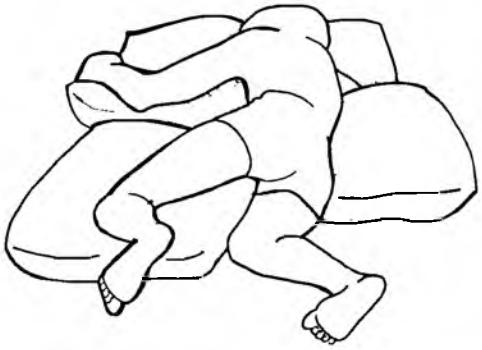


Fig. 1. Positioning on sound side.

Fig. 2. Positioning on affected side.

Fig. 3. Turning onto sound side.

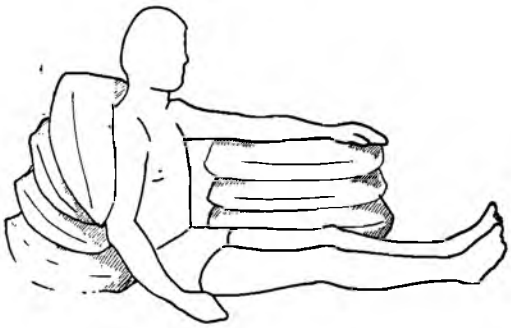
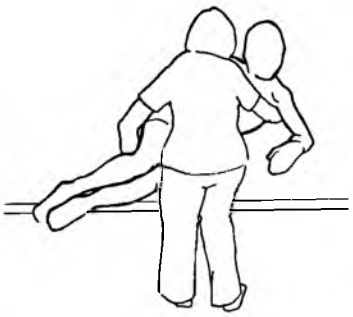
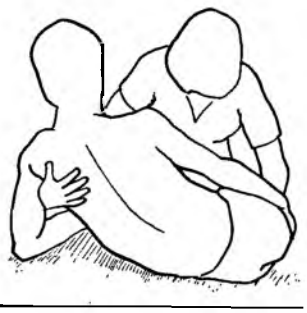


Fig. 4. Sitting in bed.





Figs. 5 and 6. Moving from lying to sitting on side of bed.

of support. In this position the scapula is retracted and the humerus is frequently slightly abducted, predisposing to subluxation. Nursing staff and family must, from the beginning, be shown how to increase the patient's awareness of his affected side. His bed should be positioned so that he has to look across his affected side at the rest of the room; he should be approached on the affected side, fed and given a bedpan from that side. Visitors should sit on that side, and holding his affected hand will increase sensory awareness. As soon as he is able to do so, provided that the scapula is mobile, he should be shown how to move his affected arm with his sound arm. In order to do this he clasps his hands with fingers interlaced and with the affected thumb uppermost. He is taught first to extend his arms forwards until both scapulae are protracted and elbows extended. His palms should be together, with thumbs facing upwards, and the movement should take place symmetrically with hands in the midline (Fig. 7). Once he can achieve this he can be taught to lift his arms upwards through the full range of elevation through flexion.

## PREVENTION OF SUBLUXATION

Occasionally during the flaccid stage additional support may be needed to control subluxation. Slings are contraindicated on several counts. They contribute to the patient's lack of awareness of the affected arm, they immobilize the joints of the arm and they reinforce the developing spastic synergy. The sustained stretch which triceps undergoes within a sling will lead to progressive inhibition of triceps and, reciprocally, to increased activity in biceps (Stockmeyer, 1967). The use of a sling also disturbs balance, interferes with facilitation of walking and makes a reciprocal armswing impossible. It is also impossible to inhibit associated reactions in the arm. Frequently the hand hangs over the edge of the sling, resulting in oedema and in pain when weightbearing on a flat hand is attempted. Bobath (1978) describes an effective method of preventing subluxation whilst allowing full range of movement in elevation through flexion. It consists of a cuff which fastens around the upper arm and is suspended by a figure-of-eight band around the shoulders (Fig. 8). It is found in practice that a thin layer of foam-rubber under the cuff prevents slipping and allows the cuff to be fastened less tightly, whilst an elasticated band around the shoulders adds to comfort. This method does not interfere at all with movement of the elbow, forearm and hand. An earlier method consisting of a small pad in the axilla, again held by a figure-of-eight bandage, is not recommended as it results in slight abduction of the humerus and this may, in turn, predispose to subluxation.

## INHIBITION OF SPASTICITY

Correct positioning and handling, as outlined above, will do much to prevent the development of spasticity and fixation of the scapula. As tone starts to increase, spasticity first becomes evident distally, in the flexors of the wrist and fingers. At this stage a foam-rubber "spreader" may be effective not only in inhibiting this distal spasticity but also in retarding the development of flexor spasticity throughout the arm. As spasticity,

Fig. 7. Self-assisted arm movement.

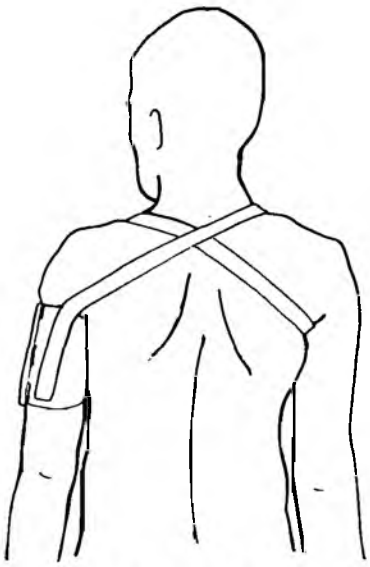


Fig. 8. Control of subluxation.

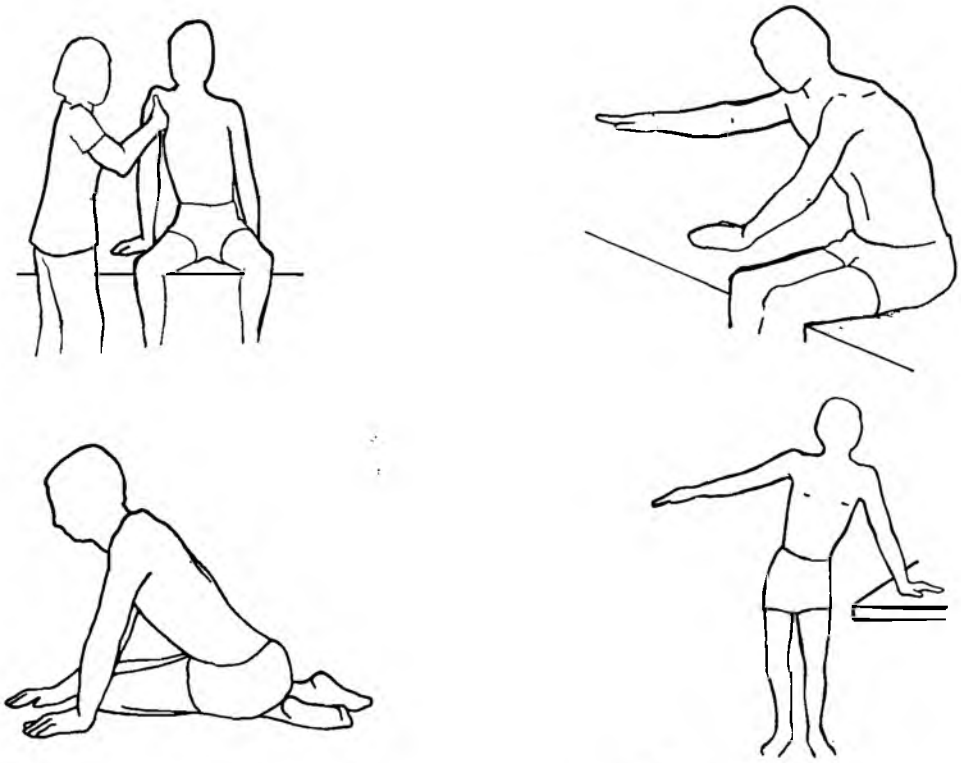
i.e. increased tone, develops, so also does the degree of reciprocal activity change. Distally we find complete reciprocal inhibition with a dominance of flexor activity over extensor activity, whereas proximally there develops a contratcion of opposing muscle groups. This is particularly evident around the scapula which may become completely immobile, although in a position of retraction and downwards rotation of the glenoid fossa, reflecting the relative dominance of the spastic muscle groups. Since the most common cause of pain in the shoulder of a hemiplegic patient is pinching of the capsule and synovium when the humerus is forced into flexion or abduction against an immobile scapula, this excessive co-contraction must be prevented and full scapular mobility established. In addition, the overactivity of subscapularis, infraspinatus and teres minor which contributes to the depression of the humeral head in the glenoid fossa must be inhibited.

If spasticity is strong, preliminary reduction of tone may be achieved by moving the trunk over the affected shoulder. In supine the affected side of the trunk is elongated and the affected arm is abducted as far as is possible without encountering resistance. The patient is then asked to bring his sound arm and leg across his body and roll onto his affected side. After several repetitions a reduction in tone will be felt and the scapula may then be mobilized in supine or in side-lying on the sound side. In either case the affected side must be fully elongated and the scapula protracted before elevation and depression of the scapula are superimposed. The arm is supported in a reflex-inhibiting pattern of forward extension and outward rotation of the shoulder, extension of the elbow, supination of the forearm, extension of the wrist and fingers and extension/abduction of the thumb. When the scapula moves freely the arm is taken gradually into full elevation. If pain is encountered the arm must be moved down a few degrees and the scapula fully protracted before continuing towards elevation. Provided that the scapula is kept mobile the patient can, himself, carry out self-inhibition in sitting or lying as described earlier.

## EARLY RE-EDUCATION OF MOVEMENT

In the normal person a relative degree of co-contraction of opposing muscle groups gives stability and postural fixation proximally, but never interferes with movement. Distally a greater degree of reciprocal inhibition allows quick movements to occur freely, but these skilled movements would not be possible without the aforementioned proximal fixation. In the flaccid stage of hemiplegia the patient lacks the normal degree of postural stability and proximal fixation which would protect his shoulder from trauma and during this stage of treatment early weight-bearing is indicated in order to stimulate sufficient co-contraction to stabilise the glenohumeral joint. Weight-bearing activities must not, however, be static. Static holding of positions will lead to excessive co-contraction and resultant fixation of both scapula and glenohumeral joint. Suitably mobile weight-bearing activities are shown in the accompanying sketches (Figs. 9 - 12). An essential prerequisite for all these activities is weight-transfer to and elongation of the trunk on the affected side of the body.

As spasticity develops, certain muscle groups dominate patterns of posture and movement and their antagonists become progressively inhibited. The patient cannot stabilise the scapula in protraction and outwards rotation; he cannot reach forwards with extended elbow or raise his arm above shoulder level because of the spasticity of the opposing muscles. This spasticity can be inhibited as described in the previous section but the problem of activating the apparently "weak" muscles remains and until the patient has full control of both scapular and glenohumeral movements the possibility of trauma to the glenohumeral joint remains. Following inhibition, techniques of proprioceptive stimulation (tapping) may be needed to activate patterns of movement in elevation. Firstly the patient needs to be given the ability to hold the arm in whatever position it is placed. Only after this has been achieved can facilitation of active movement towards that position be attempted. Suitable activities at this stage of treatment are shown in figures 13 - 16.



**Figs. 9 - 12. Mobile weight-bearing activities.**

If this programme is followed, the probability of gleno-humeral problems will be reduced to a minimum. However, if they do occur, it seems that the associated pain is less intense; as the inert joint structures are probably the ones affected the complication is readily treatable by passive mobilisation techniques according to Maitland (1977). Treatment is therefore directed at the pain. It has been found that passive lateral rotation of the glenohumeral joint is very often limited and that this is the most painful movement. Lateral rotation of the glenohumeral joint is of course enhanced by retraction of the scapula and this could possibly be a precursor to the painful shoulder syndrome.

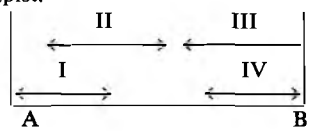
## TREATMENT PROCEDURE

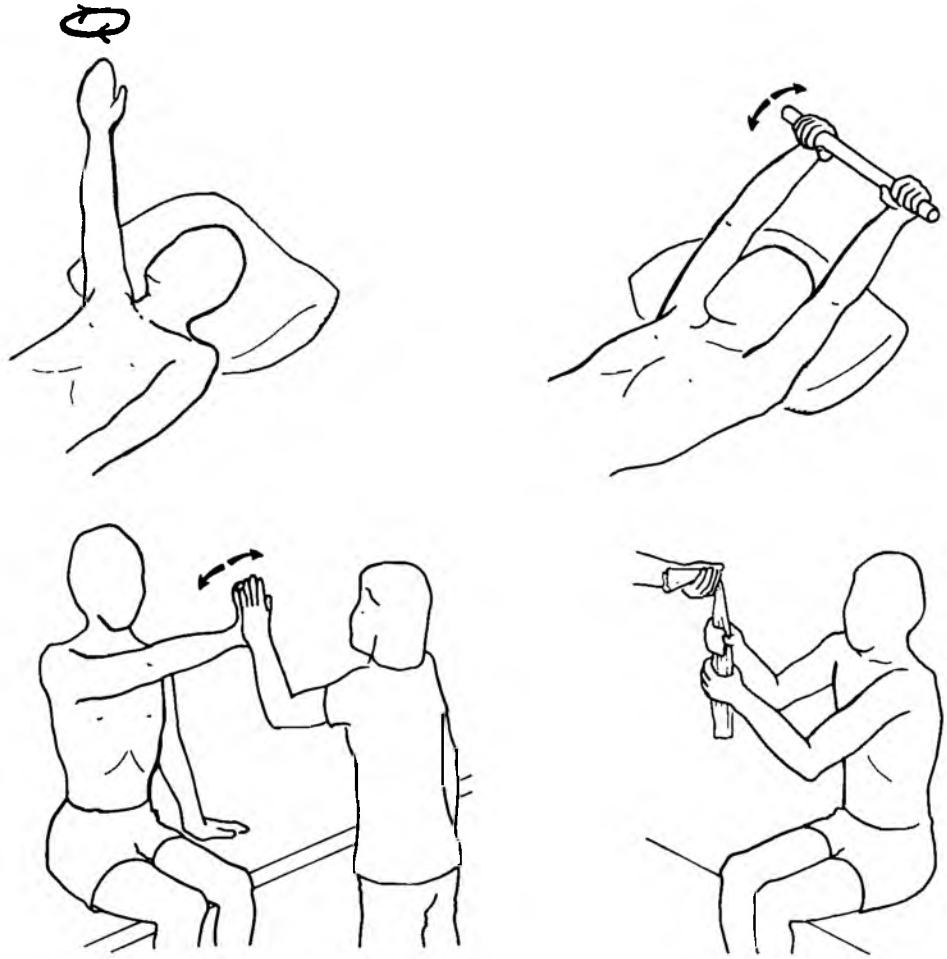
The passive mobilisation techniques used to treat this condition are directed towards relieving pain. Careful assessment is the crux of successful treatment. The assessment is complicated both by the frequent absence of active movement and by the fact that spasticity may prevent passive movement of the glenohumeral joint. It is, however, possible to plot a graph of the intensity of pain on the y-axis against the range of passive movements of the klenohumeral joint (usually flexion) provoking pain on the x-axis (a movement diagram, Maitland, 1977) and to assess the pain reaction to passive movement, ensuring a fairly accurate estimation of "irritability". The use of passive accessory movements at the limit of the physiological range is advised if up to 80% of the passive physiological range is painfree. From this information it is possible to plan treatment and to determine the necessary techniques, dosage and frequency of treatment.

Before commencing either objective assessment or treatment by passive mobilisation techniques, it is essential to inhibit spasticity and to position the patient correctly. The appropriate inhibiting techniques as previously indicated must be fulfilled. The patient should then be positioned in lying with his head on a small pillow so that the glenohumeral joint can move freely. The hemiplegic side must be elongated and the hemiplegic leg must also be placed in a reflex inhibiting pattern. By virtue of the very starting positions needed to achieve the mobilisation techniques proposed, it will be seen that the scapula is brought into the protracted position. During the early rehabilitation phase Grade I - 111* passive accessory movements (longitudinal or posterior-anterior movements respectively with the glenohumeral joint in the neutral position (Fig. 17) are usually required. In old-established hemiplegia, it is often necessary to take the shoulder to the limits of the physiological range of forward flexion and to execute Grade I - III passive accessory movements (usually longitudinal or postero-anterior

* A passive accessory movement is a joint movement which cannot normally be performed actively and has to be executed by an external force or the hands of the physiotherapist.

Grades of movement





**Figs. 13 - 16. Re-education of movement patterns.**

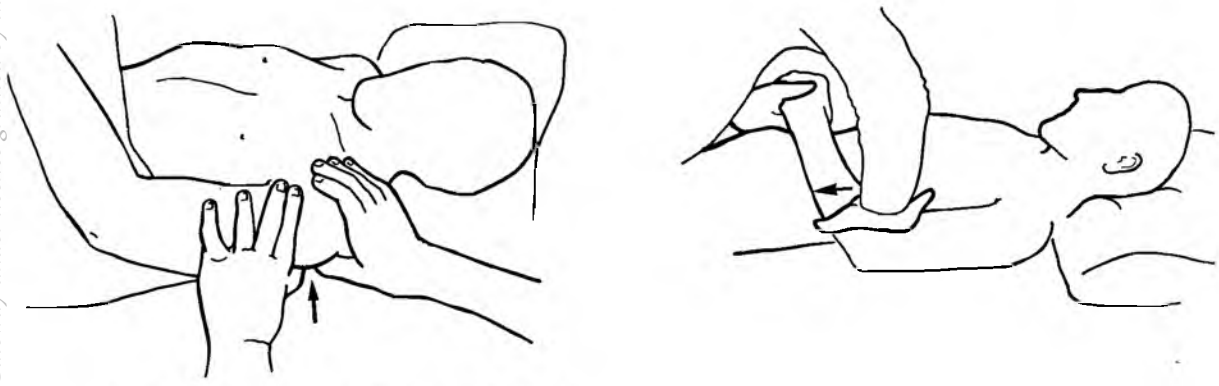


**Fig. 17. Postero-anterior and longitudinal accessory passive movements in the neutral position.**

movements) (Fig. 18). The position could of course be vice versa. Assessment of the joint in the old established hemiplegia for instance, could reveal that it is "hyperirritable", whereupon the treatment techniques and dosage would have to be suitably adapted.

The use of passive accessory movements to treat the pain has been found preferable for it seems that the use of passive physiological movements tends to provoke spasticity unless the latter are performed very slowly and smoothly as a more sustained type of

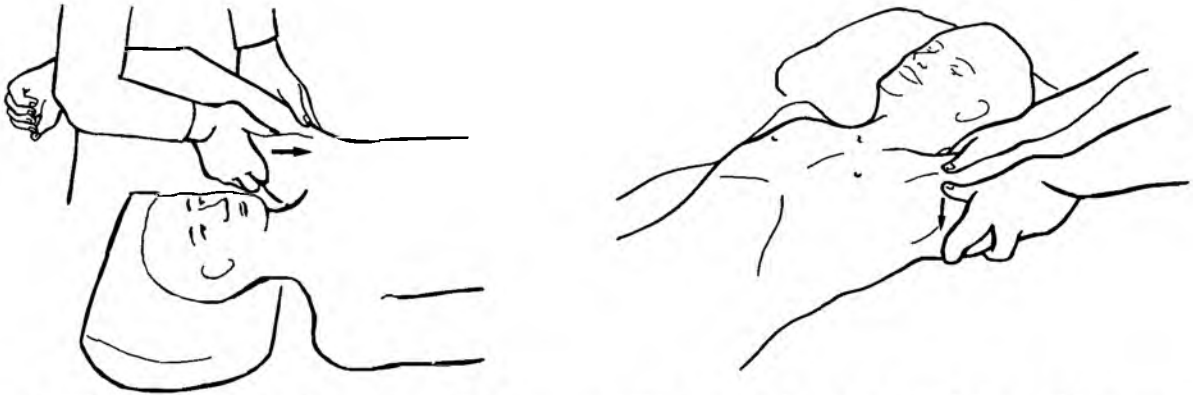


**Fig. 18. Longitudinal and postero-anterior accessory passive movements at the end of the available range of movement.**

technique. Once the pain has been relieved it is essential to reinforce the preventative programme by checking both the nursing procedures within the hospital and the handling by the family at home. The patient should once again be instructed as to the importance of putting his gleno-humeral joint through its full range at least once a day.

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