

TRAUMATIC BRACHIAL PLEXUS INJURY

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Mechanism of injury

- High velocity injury - stretch injury
- Low impact injury - stretch injury
- Lacerations

If the injury was sustained due to a high velocity accident e.g. a motorcycle RTA, then the likelihood of a more serious pathology is much greater than someone who has sustained an injury from a fall. Patients involved in high velocity accidents are also more likely to sustain other injuries e.g. Head injuries, spinal and upper limb fractures and vascular damage.

Patients who have sustained a brachial plexus lesion will present with motor and sensory loss in all or part of the upper limb depending on the extent of the injury.

Clinical factors indicating a relatively mild lesion:

- Low impact
- Incomplete lesion
- No pain
- Tinel's sign
- Absent Horner's sign

Clinical factors indicating a more serious lesion:

- High impact injury
- Complete lesion
- Burning or shooting pains present since the time of injury

- Horner's sign (ptosis or drooping of the eyelid with dilation of the pupil)

Damage to the BP can also occur as the result of tumours or as a result of radiation treatment. Therapist guidelines for the management of patients with an acute brachial plexus injury (pre and post-surgery)

Grades of injury

The damage to the brachial plexus nerves can be classified into four different grades:

1. Pre-ganglionic tear.....Nerve root avulsion
2. Post-ganglionic tear.....Neurotmesis
3. Severe lesion in-continuity.....Axonotmesis
4. Mild lesion in-continuity.....Neurapraxia

The number and combination of nerves injured are very variable. It should be noted that some patients can present with a combination of root avulsions, post-ganglionic tears and lesions in-continuity.

Adult brachial plexus injuries fall into two categories:

1. Supraclavicular injuries.....Nerves damaged above the clavicle
2. Infraclavicular injuries.....Nerves damaged below the clavicle

It is possible for nerves to be injured both above and below the clavicle.

Supraclavicular injuries

Supraclavicular injuries can be caused by a traction injury to the brachial plexus e.g. In a motorcycle accident where the head is side flexed and the shoulder girdle is depressed, or through direct trauma e.g. Knife injury or gunshot wound.

Common patterns of supraclavicular injury occur and can be subdivided into three groups:

1. Upper plexus C5,6 (+/-C7 and +/-C8) If C7 and C8 are involved the roots are sometimes avulsed. There is less likelihood that the roots of C5 and C6 will be avulsed.
2. Total plexus - there is damage to all nerve roots. C5, C6 may have post ganglionic ruptures with the roots of C8 and T1 avulsed.
3. Lower plexus - the roots of C8 and T1 are avulsed but C5 and C6 are working normally.

Avulsion injury/Preganglionic injury

A high velocity accident is more likely to cause avulsion of the nerve roots from the spinal cord. If the nerve roots are avulsed in this way, there is no successful method available for re-implanting the rootlets. Patients presenting with avulsion injuries usually complain of an instantaneous onset of pain. This is commonly described as a deep burning pain with frequent shocks of shooting pains throughout the day. The pain is caused by deafferentation of the dorsal horn, which means that with no input from the periphery, pain information passes from the dorsal horn to the brain unmodulated. Interestingly, these patients usually do not have problems with sleep disturbance due to pain.

Apart from the clinical examination, an MRI scan will often help to confirm the diagnosis. From the scan results, the location of the root avulsion can sometimes be seen, as there is the presence of a meningocele (sack filled with CSF leaking from the spinal cord).

Although re-implantation of nerve rootlets is not widely used, other methods of restoring nerve supply can be undertaken, e.g. Nerve transfers. This will vary from patient to patient and will depend on the extent of the damage and therefore the feasibility of using unaffected nerves. Commonly used nerves for nerve transfers are the intercostals, accessory nerve and the medial pectoral nerve.

This group of patients will always have some form of motor deficit. Secondary operations may be considered - for example an unstable shoulder may benefit from a shoulder arthrodesis.

Infraclavicular injuries

This type of injury can affect any one or all of the peripheral nerves. The most common presentations are:

- A complete lesion
- Damage to axillary nerve
- Damage to musculocutaneous nerve

These injuries are usually caused by excessive tractioning of the brachial plexus e.g. Following shoulder dislocation or in conjunction with a fractured humerus.

As with all BPI, assessment including muscle testing, sensation testing and neurophysiology tests help to complete the clinical picture. It is especially important to check with those patients presenting following shoulder dislocation that the disruption of shoulder movement is not caused by a tear in the rotator cuff.

Where there has been a severe infraclavicular injury affecting several peripheral nerves, the surgeon may choose to reconstruct only some of the peripheral nerves. This could be because the gap between the damaged nerve ends is too wide to successfully bridge. Sometimes if a nerve is irreparable it is used to reconstruct another peripheral nerve.

Surgical patient

Before deciding to operate the surgeon will take into consideration the age of the patient. Older patients are known to not recover as well from reconstruction surgery as younger patients.

There are two categories of surgical patient:

1. Primary
2. Secondary

Primary repairs

These are normally carried out as soon as possible and usually within 3 months of injury.

1. Nerve grafting/reconstruction
2. Nerve transfer

Nerve graft/Nerve transfer

Post-operatively patients who undergo nerve grafting and nerve transfers are managed in a similar way. They will usually have been assessed at the Brachial Plexus Injuries Clinic pre-operatively. In addition other investigations such as neurophysiology tests and MRI will already have been done.

Other assessment tools used at the department are the DASH questionnaire, and the Narakas Score. These are recorded at regular intervals.

When a patient is admitted to the ward the physiotherapy staff liaise with the physician, nurse and Occupational Therapist. A unified approach is important to avoid conflicting information being given to the patient.

The following are guidelines for therapists treating patients when a brachial plexus injury has been suspected.

Consultant referral to the peripheral nerve injury (PNI) consultant recommended (ideally within 3/52).

Pre-operative assessment

Please assess:

- Strength (Manual Muscle Test)
- Sensation (ASIA Points)
- Pain (VAS)
- Oedema

Avoid:

- Functional use of the affected limb
- Full PROM
- Adverse neural dynamics

Contraindications:

- Unstable fractures (clavicle, humerus, scapula)
- Cervical spine injuries
- Haematoma/vascular injury

N.B. Please note if the patient is experiencing pain on movement (PROM or AROM) at the time of initial assessment aim to protect the arm in a sling. We advise no glenohumeral joint ROM, but to retain PROM at the hand, wrist and forearm.

Post-operative management of brachial plexus injuries following surgical intervention:

The post-operative management of brachial plexus patients post operatively is dependent on the extent of surgery undertaken. The following are guidelines only and the surgery undertaken in each individual case needs to be considered before intervention.

Aims of treatment

- Increase/maintain range of movement
- Mobilise tight scar tissue
- Maintain good joint position, splint if necessary
- Discuss/help with pain control
- Improve posture and balance
- Encourage return to work or sport

In terms of rehabilitation, the main aim is to maintain joint range of movement, improving muscle power in any group of muscles that have surviving motor units and regain a maximum level of function.

Aim of surgery and expected outcome

The aim of a primary repair is principally to improve motor function. However, primary surgical repair can aim to improve sensory function particularly protective sensation in the hand.

The expectation from primary repair is to achieve elbow flexion. Results in terms of effective shoulder control have so far been mixed with some patients requiring a secondary operation for shoulder arthrodesis.

Hand and wrist function can be improved with primary surgery but if necessary can benefit from secondary operations e.g. Tendon transfers and bony fusions.

Secondary operations

Secondary operations fall into two categories:

1. Bony fusions
2. Tendon transfers

Bony fusions will only be considered when there is no chance of further useful recovery. The joints most commonly fused are the wrist and the shoulder.

Shoulder arthrodesis

This is one of the most common secondary operations undertaken. It is performed because the patient has poor shoulder control but has gained other functional return in the hand and elbow. Due to the lack of control at the shoulder the rest of the upper limb's

function cannot be maximised. In order for the patient to be suitable for this procedure they must have good thoracoscapular muscle power e.g. upper trapezius, serratus anterior.

Rehabilitation

Following shoulder arthrodesis patients are immobilised in an abduction brace for at least 6 weeks. They are advised about the position, function and appearance of the brace. Once the brace is removed they can start passive and active movements. The range of movement usually progresses quite quickly, with the expectation that they will be able to achieve between 60 to 90 degrees of elevation and abduction.

The patient is warned that they will have loss of medial rotation, hand behind back and that the arm will hang in a slightly abducted position.

Tendon transfers

Tendon transfers are considered at a later stage, usually at about two years post injury. Sometimes tendon transfers will be considered before this to aid function while recovery in the nerves takes place.

Tendon transfers are most commonly performed in the hand. However, occasionally free muscle transfers may be used to improve elbow flexion e.g. Gracilis.

Patients who present with avulsion of the roots of lower trunk (C8 -T1) only may eventually be appropriate for tendon transfer. In order for this to be successful it is important to teach the patient how to maintain joint range of movement and to maximise the strength in the muscle groups which are still functional. Tendons used for transfer must be a Grade 4 or better. Tendon transfers in the hand must be planned so that pinch and grip will be improved.

Rehabilitation involves the re-education of function, occasionally with trick movements or with the co-ordination of other movements e.g. Wrist extension with finger flexion. Operation notes will be available with some indication of the exercises/functional movements that the patient has to perform.

The non-surgical group of patients

Patients who fit into this category are those who have suffered temporary damage to the conduction of the nerve for example a neurapraxia or an axonotmesis or those who have had a virus causing a brachial neuritis. These injuries/pathologies can take from several months to over a year to recover and it is therefore essential that the patient understands this and knows the importance of maintaining joint range of movement while waiting for recovery.

Rehabilitation of the non-surgical patient

Physiotherapy input is important and it needs to be tailored to suit the individual patient. Reassurance is one of the key issues and it is important to fulfil this role. It may be that the patient only needs to have treatment once every 4 to 6 weeks if they are managing their exercises and have good range of movement.

It may be necessary to provide some form of splinting to aid function or to maintain hand position. If you feel that this would be beneficial and are unable to provide this type of splinting please contact the BPI service.

When planning return visits you should take into consideration the stage of recovery and estimated time for signs of recovery starting. Sometimes early signs of recovery are difficult to detect and this highlights the importance of accurate record keeping. Once a flicker of muscle contraction can be detected the patient should then be started on exercises to maximise this improvement e.g. Ice brushing, muscle stimulation gravity-assisted exercises.

Even the smallest sign of recovery gives the patient tremendous encouragement.

Nerve repair graft of brachial plexus

Post-operative management

Time post operation		
0-6/52	<p data-bbox="673 1129 927 1161">SLING/ SUPPORT</p> <p data-bbox="673 1293 748 1325">ROM</p> <p data-bbox="673 1623 748 1654">PAIN</p> <p data-bbox="673 1734 837 1766">FUNCTION</p> <p data-bbox="673 1845 943 1877">SKIN/ SCAR CARE</p>	<p data-bbox="1096 1129 1430 1220">Arm is immobilised in a sling (i.e.</p> <p data-bbox="1096 1241 1365 1272">Lancaster/Umerus)</p> <p data-bbox="1096 1293 1398 1383">No gleno-humeral joint movement.</p> <p data-bbox="1096 1404 1455 1600">Maintain AROM/PROM of hand, wrist and forearm. No elbow movement if infraclavicular repair.</p> <p data-bbox="1096 1621 1414 1711">Consider pain levels and monitor.</p> <p data-bbox="1096 1732 1463 1822">Advise strip washing for the 6/52 period.</p> <p data-bbox="1096 1843 1463 1875">Advise use of baby wipe for</p>

<p>2/52 Outpatient Clinic review</p> <p>6-12/52</p>	<p>OEDEMA</p>	<p>Axilla hygiene.</p> <p>Be mindful of scar healing for 4/52</p> <p>On mobilising i.e. Nerve graft sites.</p> <p>Wound/Scar care as appropriate.</p> <p>Oedema management -please Monitor.</p> <p>Wound check by SHO/registrar.</p> <p>Review of pain management Strategies by SHO/registrar (as Appropriate).</p> <p>Re-enforcement of post-operative Precautions.</p> <p>Refer to occupational therapy (clinic).</p> <p>Scar care management to Commence.</p> <p>Aim to have either:</p> <ul style="list-style-type: none"> • Initial physiotherapy/ Occupational therapy. <p>BPL assessment form to be</p>
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		<p>Completed and mobilisation to Commence</p> <p>To include:</p> <ul style="list-style-type: none"> • AROM/ Strength (Manual Muscle Test) • PROM-commence full PROM • Sensation (ASIA Points) • Pain (VAS) • Oedema • Function / ADL's • Psychological/emotional • Postural education • Balance/gait retraining. • Review of slings/ supports <p>Consider referral to:</p> <ul style="list-style-type: none"> • Orthotics • Psychology <p>Patient education re: management Of injury.</p> <p>Review patient goals.</p> <p>Outpatient treatment to be Continued as injury/ treatment plan</p> <p>Dictates.</p>
12+/52		<p>Maintain passive and active Assisted movements.</p> <p>Begin resistive exercise if Appropriate recovery of</p>

		<p>muscle (grade 3/5).</p> <p>Continue progressive strengthening Regimes, avoiding trick movements And substitute muscle patterning. Discharge when optimised muscle Strength, nerve mobility and Maximised functional recovery.</p>
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Please note **contraindications** to the above could be:

- Trauma e.g. Bony injuries
- Reconstructive surgery
- Vascular Injury

Brachial plexus exploration, decompression and/or neurolysis Post-operative management

Time post operation		
0-6/52	<p>SLING/SUPPORT</p> <p>ROM</p>	<p>Sling for comfort.</p> <p>For infraclavicular explorations: Commence PROM of hand, wrist, Forearm, elbow and</p>

	<p>ROM</p> <p>PAIN</p> <p>FUNCTION</p> <p>SKIN/ SCAR CARE</p> <p>OEDEMA</p>	<p>glenohumeral Joint ER(N). Abduction to 40 degrees (to protect a pectoralis Major repair).</p> <p>For supraclavicular Explorations: Commence PROM of hand, wrist, Forearm rotators, elbow, glenohumeral Joint ER(N) Forward flexion to 90 degrees. Abduction to 40 degrees Avoid resistance and/ load upon Operated limb. Consider pain levels and monitor.</p> <p>Keep the limb supported while dressing.</p> <p>Be mindful of scar healing for 4/52 On mobilising. Wound/scar care as appropriate. Oedema management -please Monitor.</p>
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<p>2/52 Outpatient Clinic Review</p>		<p>Wound check by SHO/registrar. Review of pain management Strategies by SHO/registrar (as Appropriate). Re-enforcement of post-operative Precautions. Refer to physiotherapy and/or Occupational therapy (clinic). Scar care management to Commence.</p>
<p>6/52+</p>		<p>Aim to have either:</p> <ul style="list-style-type: none"> • Initial physiotherapy/ Occupational therapy <p>BPL assessment form to be Completed and mobilisation to commence</p> <p>To include:</p> <ul style="list-style-type: none"> • AROM/strength (Manual Muscle Test) • PROM-commence full PROM • Sensation (ASIA Points) • Pain (VAS) • Oedema <p>Function/ADL's</p> <ul style="list-style-type: none"> • Psychological/emotional

	<ul style="list-style-type: none"> • Postural education • Balance/gait retraining • Review of slings/supports <p>Consider referral to:</p> <ul style="list-style-type: none"> • Orthotics • Psychology <p>Patient education re: Management of injury. Start full PROM programme. Begin resistive exercise if Appropriate recovery of muscle (grade 3/5). Continue progressive Strengthening regimes, avoiding Trick movements and substitute Muscle patterning. Discharge when optimised muscle Strength, nerve mobility and Maximised functional recovery.</p>
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Please note **contraindications** to the above could be:

- Trauma e.g. Bony injuries
- Reconstructive surgery
- Vascular injury

Nerve transfers to regain function

Oberlins Nerve transfer (Ulnar nerve fascicle rerouted into the bicep muscle belly)

Please note: With any nerve transfer surgery activation of the intended muscle is variable and often unique to the individual patient. A definitive timescale of recovery is therefore not possible.

Post-operative management

Time post operation		
<p>0-6/52</p>	<p>SLING/ SUPPORT</p>	<p>Arm is immobilised in the sling (i.e. Lancaster/Umerus).</p>
	<p>ROM</p>	<p>No gleno-humeral joint movement.</p> <p>NO AROM/PROM of forearm Rotators or elbow.</p>
	<p>FUNCTION</p>	<p>Maintain AROM/PROM of hand, Wrist. No pronation/ supination.</p>
	<p>SKIN/ SCAR CARE</p>	<p>Advise strip washing for the 6/52 Period. Advise use of baby wipe for Axilla hygiene.</p>
	<p>OEDEMA</p>	<p>Be mindful of scar healing for 4/52. Wound/scar management as Appropriate. Oedema management-please Monitor.</p>

<p>2/52 (Outpatient Clinic review)</p> <p>6-12/52</p>		<p>Wound check at by SHO/registrar.</p> <p>Re-enforcement of post-operative</p> <p>Precautions.</p> <p>Refer to physiotherapy and/or Occupational therapy (clinic) as appropriate.</p> <p>Scar care management to Commence.</p> <p>Aim to have either:</p> <ul style="list-style-type: none"> • Initial <p>Physiotherapy/occupational Therapy assessment</p> <p>Consider:</p> <ul style="list-style-type: none"> • Strength of bicep (Manual Muscle Test) • AROM • Full PROM • Sensation • Pain (VAS) • Oedema • Function/ ADL's • Psychological/emotion • Postural education <p>Set patient goals.</p>
<p>12+/52</p>		<p>Maintain passive and active assisted</p> <p>Movements.</p> <p>Begin resistive exercise if</p>

		<p>Appropriate recovery of muscle (grade 3/5). Continue progressive strengthening Regimes, avoiding trick movements And substitute muscle patterning. Discharge when optimised muscle Strength and maximised functional Recovery.</p>
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Nerve transfers to regain function

Somsak Axillary Nerve Transfer: (Radial nerve from long head of triceps rerouted to the axillary nerve with the aim of activation of deltoid)

Please note: With any nerve transfer surgery activation of the intended muscle is variable and often unique to the individual patient. A definitive timescale of recovery is therefore not possible.

Post-operative management

<p>Time post operation 0-6/52</p>	<p>SLING/ SUPPORT</p> <p>ROM</p>	<p>Arm is immobilised in a sling (i.e. Lancaster/Umerus). No gleno-humeral joint movement.</p>
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<p>2/52 (Outpatient Clinic review)</p> <p>6-12/52</p>	<p>FUNCTION</p> <p>SKIN/ SCAR CARE</p> <p>OEDEMA</p>	<p>Maintain AROM/PROM of hand, Wrist and forearm rotation. Advise strip washing for the 6/52 Period. Advise use of baby wipe for Axilla hygiene. Be mindful of scar healing for 4/52. Wound/scar management (as Appropriate). Oedema management-please Monitor</p> <p>Wound check at by SHO/registrar. Re-enforcement of post-operative Precautions. Refer to physiotherapy and/or Occupational therapy (clinic) as Appropriate. Scar care management to Commence. Aim to have either:</p> <ul style="list-style-type: none"> • Initial <p>Physiotherapy/occupational Therapy assessment Consider:</p>
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		<ul style="list-style-type: none"> • Strength of deltoid (Manual Muscle Test) • AROM • Full PROM • Sensation • Pain (VAS) • Oedema • Function/ ADL's • Psychological/emotion • Postural education • Sulcus/ GHJ posture <p>Set patient goals.</p> <p>Begin resistive exercise if appropriate recovery of muscle (grade 3/5).</p>
<p>12+/52</p>		<p>Continue progressive strengthening</p> <p>Regimes, avoiding trick movements</p> <p>And substitute muscle patterning.</p> <p>Discharge when optimised muscle strength and maximised functional Recovery.</p>

Nerve transfers to regain function

Spinal Accessory Nerve to Supraclavicular Nerve Transfer

(Spinal accessory taken from Upper Traps rerouted to the supraclavicular nerve for re-Innervation of Supraspinatus and Infraspinatus).

Please note: With any nerve transfer surgery activation of the intended muscle is variable and often unique to the individual patient. A definitive timescale of recovery is therefore not possible.

<p>Time post operation 0-6/52</p>	<p>SLING/ SUPPORT</p> <p>ROM</p>	<p>Arm is immobilised in a sling (i.e. Lancaster/Umerus).</p> <p>Occasionally patient will be fitted With a Philadelphia Collar.</p> <p>No gleno-humeral joint Movement.</p> <p>Maintain AROM/PROM of hand, Wrist, forearm rotation, and</p>
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	<p>FUNCTION</p> <p>SKIN/ SCAR CARE</p> <p>OEDEMA</p>	<p>elbow</p> <p>ROM exercises.</p> <p>Advise strip washing for the 6/52</p> <p>Period. Advise use of baby wipe for</p> <p>Axilla hygiene.</p> <p>Be mindful of scar healing for 4/52.</p> <p>Wound/ Scar care (as appropriate)</p> <p>Oedema management please</p> <p>Monitor</p>
<p>2/52</p> <p>(Outpatient</p> <p>Clinic review)</p>		<p>Wound check by SHO/ registrar.</p> <p>Re-enforcement of post-operative</p> <p>Precautions.</p> <p>Refer to physiotherapy and/or Occupational therapy (clinic) as</p> <p>Appropriate.</p> <p>Scar care management to</p> <p>Commence.</p>
<p>6-12/52</p>		<p>Aim to have either:</p> <ul style="list-style-type: none"> • Initial <p>Physiotherapy/occupational</p> <p>Therapy assessment</p> <p>Consider:</p> <ul style="list-style-type: none"> • Strength of Supraspinatus And Infraspinatus (Manual

<p>12+/52</p>		<p>Muscle Test)</p> <ul style="list-style-type: none"> • AROM • Full PROM • Sensation • Pain (VAS) • Oedema • Function/ ADL's • Psychological/emotion • Postural education • Sulcus/GHJ Posture <p>Set patient goals</p> <p>Begin resistive exercise if</p> <p>Appropriate recovery of muscle</p> <p>(grade 3/5).</p> <p>Continue progressive strengthening</p> <p>Regimes, avoiding trick movements</p> <p>And substitute muscle patterning.</p> <p>Discharge when optimised muscle</p> <p>Strength and maximised functional</p> <p>Recovery.</p>
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Pain

Some patients who have severe pain may find pain relief modalities helpful (i.e. TENS or acupuncture). The most effective method of easing patient's awareness of pain is by action and distraction. The Clinical Nurse Specialist offers relaxation therapy and counselling whilst occupational Therapists can also utilise relaxation and visualisation techniques as a part of a pain management programme and discuss various coping skills that can be utilised with chronic pain.

Since causalgia is related to tension and stress, relaxation techniques are beneficial in pain management. Some patients may be referred to their local pain control team. However, their pain medication is discussed at the clinic and recommended changes in their drugs are conveyed to the patient's GP.

For patients complaining of mechanical pain related to shoulder sub-luxation, it may be worthwhile trying a shoulder support.

One year +

Patients should be starting to show signs of recovery in the nerves that have been reconstructed. Early signs would be a progressive Tinel's sign which would become apparent before other signs of recovery. Once a flicker can be detected in a muscle it is important to intensify treatment again. It may be that patients are shown anti-gravity positions to exercise in, or use muscle stimulators over motor points or ice brushing. Sometimes it is hard to convince the patient that the muscle is working as no movement is being produced. Once recovery starts it normally continues to progress. Recovery may continue for 4 to 5 years.

Physiotherapy Exercise Programme

The following programme of exercises is designed to help you be as independent as possible while doing the exercises.

You will be told when you are ready to start these exercises. A physiotherapist will show you exactly what you have to do.

The shoulder and elbow exercises are usually started at 4 to 6 weeks, once the Polysling has been removed. The wrist and hand exercises can be done while the Polysling is on. You should repeat each exercise 10 times, twice or three times each day.

Shoulder exercises

1. Lying on your back, clasp your affected arm by the wrist or hand and lift your arm above your head. This should gradually improve until you are able to take your arm all the way above your head as shown.



2. You will need help with this exercise. The person helping you puts one hand across the top of your shoulder to stop it moving. With their other hand they grasp around your elbow and then fix your forearm between their body and side. Your arm is then moved out to the side as far as possible



3. You will need help with this exercise. The helper holds around your elbow to keep your arm close to your side. Their other hand holds around the wrist and in this position turns your arm out towards them.



4. Once your movement improves enough for you to reach above your head, you can stop exercises 2 and 3 and use this combined exercise instead. Lift your affected arm up as far as you can and put your hands behind your head. In this position, stretch your elbow back towards the pillow.



Elbow exercises

5. While standing, hold your affected arm around the wrist and help bend your elbow up as far as you can.



6. Straighten your elbow out as far as you can. To help you get more straightening, place your other hand behind the point of elbow.



Wrist exercises

7. While seated, help your affected hand by putting palm to palm and push the wrist back.



8. While seated, place your unaffected hand over the back of your affected hand and bend the wrist forward.



9. Hold your affected hand in the mid part of the palm and turn your hand up.



10. Hold your affected hand in the mid part of the palm and turn your palm down.



Hand exercises

11. Use your unaffected hand to help bend your fingers into your palm. Make sure you bend your fingers from the knuckles so you are curling your fingers as much as possible.



12. Spread your fingers by placing the fingers of your unaffected hand in between the fingers of your affected hand and stretch them apart.



Thumb exercises

13. Stretch your thumbs across your palm as far as you can.



14. While seated, fix your hand between your knees and stretch your thumb away from the fingers.

