

PHYSIOTHERAPY PROTOCOLS

FOR THE MANAGEMENT OF DIFFERENT TYPES OF BRACHIAL PLEXUS INJURIES

Introduction

As such, protocols in the management of brachial plexus injuries (BPI) are a bit of a misnomer. This is because no two injuries are identical and no two patients recover in the same way or at the speed. However basic principles of management can be applied no matter what the level of the patient's injury.

Classification of nerve injuries+

By being able to define the type of nerve injury the clinician can predict if there will be recovery. Nerve injuries were first classified by Seddon (1943) into three groups: neurapraxia, axonotmesis and neurotmesis. Sunderland in 1951 divided Seddon's neurotmesis classification into three, thus developing a five category classification. In 1988, Mackinnon and Dellon added a sixth category.

For the purposes of describing and managing BPIs, the nerve injuries fall into the following categories:

1. Neurapraxia – mild lesion in continuity
2. Axonotmesis – severe lesion in continuity
3. Neurotmesis – post-ganglionic tear
4. Avulsed nerve root – pre-ganglionic tear

In the neurapraxia and axonotmesis recovery is expected as only temporary damage to the nerve has taken place. Those patients who have suffered an axonotmesis type of injury will take longer to recover as the injury involves disruption of the axon and axonal regeneration will take time. Nerve regeneration occurs at the rate of 1-3mm per day therefore recovery can take between 12 and 18 months. Patients with an axonotmesis type of injury may not regain full muscle power.

Patients who present with these types of nerve damage are most likely to have sustained low velocity injuries e.g. shoulder dislocation with or without fracture of the greater tuberosity, displaced mid humeral fractures and positional or compression palsies e.g. Saturday Night Palsy. Neurophysiology investigations can confirm the type of nerve damage.

Principles of Management

Neurapraxia and Axonotmesis

1. **Fracture/dislocation of the shoulder**

After the fracture has stabilised following a period of immobilisation in a polysling the most important aim of treatment is to regain shoulder joint range of movement. Wrist and hand mobilisation exercises should have been done through-out the period of shoulder immobilisation as a matter of course and as part of standard practice. If there has been evidence of damage to one of the peripheral nerves which is affecting hand function e.g. radial, ulnar or median nerves, care should be taken to maintain good hand position. A resting hand splint set in the normal hand resting posture is usually the best option.

Pain should be appropriately managed and advice sought, if necessary, from the patient's GP regarding pain medication. Occasionally TENS can help but needs to be applied frequently and to areas of normal sensation.

Patients who have a nerve injury as a result of their shoulder dislocation may have damage to one or more nerves. The radial, axillary, ulnar and median nerves are all vulnerable. Active shoulder joint range of movement may be slow to recover due to rotator cuff damage especially with an associated fracture of the greater tuberosity

Summary of Treatment

- **Maintain joint range of movement**
- **Use static splinting to maintain good resting position of the hand**
- **Encourage active exercises for muscle groups that are working**
- **Maximise function if necessary by modification of activities and possibly dynamic splinting**
- **Refer to OT colleague for assessment of ADLs**
- **Check balance and posture, if necessary treat appropriately**
- **Once there is evidence of recovery start progressing exercise to incorporate gravity eliminated exercises and active assisted exercises**
- **If appropriate discuss early return to work and hobbies**

2. Radial Nerve Palsy

The radial nerve is the commonly affected by compression injuries and most often results in the loss is loss of wrist, finger and thumb extension although triceps and forearm supination can also be affected depending on where the compression of the nerve has been.

The principles of treatment are simply to keep the joints of the fingers and thumb mobile and prevent tightening of the long flexors by good positioning preferably in a resting splint. Dynamic splinting with the use of an outrigger can help maintain some function while waiting for recovery. Fibrosis of the first web space is common and can be maintained or stretched by using a 'C' bar splint

Summary of Treatment

- **Maintain joint range of movement especially wrist joint extension, thumb abduction and extension and IP joint extension.**
- **Provide appropriate splinting either static or dynamic or both depending on the patient's needs.**
- **Maintain the rest of the affected upper limb, range of movement and muscle power while waiting for recovery.**
- **Arrange OT assessment of ADLs**

Principles of Management

Neurotmesis

Neurotmesis means that there is loss of continuity of the nerve and spontaneous recovery is not possible. The surgeon therefore has the options of performing a nerve graft or to transfer a nerve from a healthy donor site. Not all patients will be suitable for surgery e.g. elderly patients. More recently some patients have been offered muscle transfers if there is no other suitable alternative or if there is a more certain outcome from transferring a muscle than from nerve surgery.

Post operative management following nerve grafting or nerve transfer

Patients are immobilised in a polysling for four to six weeks.(The operation note will specify the period of immobilisation) Patients are given advice regarding the maintenance of the range of movement of the wrist and hand and reviewed at the clinic usually around the time of the sling being removed. The patient is usually anxious about moving the shoulder after the period of immobilisation in case movement in some way will adversely affect the operation site. Reassurance is required and gentle passive movements are started and progressed as the patient's tolerance allows.

Treatment Outline

4 to 6 week post-op stage

- **Passive and active range of movement exercises for the upper limb**
- **Mobilise scar tissue and if necessary consider scar tissue management if scar line is keloid i.e.raised, red or thickened**
- **Assess pain and if necessary recommend the patient discusses pain management with GP – usually post op related pain is not a problem. Occasionally patients complain of their 'original' pain being heightened as a result of the surgery, this usually settles**

- Start to encourage an increase in general exercise, this might initially be walking or swimming (depends on the wounds/ scar lines). Improvisation with buoyancy aids can help swimming or exercise in water.
- Assess ability to return to work and or hobbies – it is recognised that this is important and should be discussed early in the rehab process
- Alternative pain relief methods are an option either from TENS or acupuncture. Much interest is also being expressed in the use of mirror therapy(MT) which has been successfully used in the management of CRPS and phantom limb pain.(ref 6)

The best form of pain relief is action and distraction hence the necessity to encourage patients back to activities or work

8+ Months

Depending on the type of surgery some recovery may be detected at about 8 months. It is important during the intervening period patients maintain joint range of movement. Any joint stiffness or soft tissue tightness can make early signs of motor recovery more difficult to detect. It also makes it harder for weak muscles to exert enough force to produce movement. Early signs of motor recovery can be enhanced by the use of a muscle stimulator and this is normally used once there is a detectable flicker, Grade 1 contraction in the muscle. The motor points are found within the muscle bellies. (See motor point chart)

Loss of active elbow flexion:

One of the main aims of BPI surgery is to regain active elbow flexion. If a patient has good hand function but is waiting for recovery in biceps it may be appropriate to refer them to the orthotist for an upper limb orthoses to aid function. This enables the patient to position the arm for functional tasks by locking the elbow. The surgeon is usually responsible for making the referral to the orthotist.

*Try where possible to discourage long term use of the polysling as this can cause stiffness of the shoulder joint, affects balance and cortical mapping. The polysling can however help keep the arm out of the way during some activities e.g. running and cooking

Loss of active wrist and finger movements:

If there are no active wrist or hand movements, a night resting splint can provide a good position for the hand and wrist overnight. A removable wrist splint may help hold the wrist in a more comfortable position during the day and where this will not help the position of the finger joints it is more practical for patients to wear during the day.

Loss of wrist and finger extension:

If a patient has the ability to flex the fingers and thumb but is unable to actively extend the fingers a dynamic splint with an outrigger could help. A night resting splint will also maintain a good hand resting position. The physiotherapy service can provide any necessary splints.

Loss of pinch grip:

In lesions involving the lower trunk dynamic splinting can help pinch grip (see photo) and therefore aid function



SUMMARY

- Thorough assessment of patient to include all aspects: physical, emotional and social.
- Tailor made programme of exercises.
- Maintain of joint range of movement.
- Progress active exercise- general aerobic and anaerobic exercise, as well as exercise related to the upper limb
- Maximise function
- Encourage and support return to work and hobbies
- Help with pain management

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