

# THE LEEDS PROTOCOL FOR THE MANAGEMENT OF CEREBRAL PALSY AFFECTING THE UPPER EXTREMITY

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## INTRODUCTION

Cerebral palsy (CP) is the most common childhood cause of upper extremity motor disability, with incidence rates of 1.5 to 3.0 per 1000 live births reported.

Many questions remain unanswered in the management of this condition (figures 1 and 2) in the upper extremity. Whilst the cerebral injury is considered static, adaptations, changes in the limb and the pattern of extremity use are dynamic. The effect of surgery is often variable and the indications, choice and timing of interventions are far from defined.

The management of patients with CP requires the skills of many disciplines. Two years ago the senior author set out to develop a regional centre for the management of cerebral palsy in the upper extremity, based in Leeds. A multidisciplinary team (MDT) consisting of hand surgery, occupational therapy physiotherapy, rehabilitation medicine and clinical psychology has been established.

Using this multidisciplinary team approach and building on established classifications with our own assessment data, photography and video, it has been possible to assemble a protocol for the evaluation of a patients before and after surgical treatment.

A description of this protocol is presented.

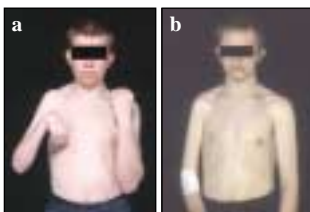


Fig. 1 A: Typical posture in CP.  
Fig. 1 B: Improvement after surgery.

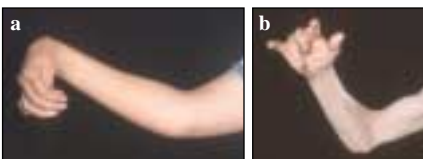


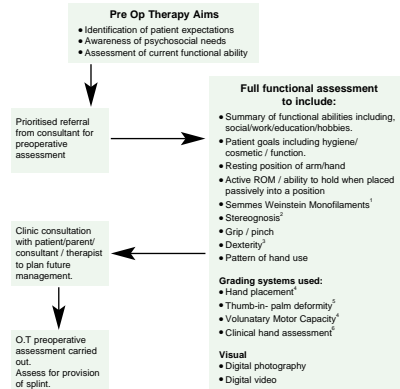
Fig. 2 A: Severe wrist flexion and thumb-in-palm deformities  
Fig. 2 B: Elbow contracture

## ASSESSMENT

### General and upper extremity assessment

Delineating the goals of surgery to the upper extremity demands an assessment in the context of the patient's general condition. The general neurological condition of the patient is assessed to formulate realistic goals on an individual basis, taking into account cognitive ability, hearing, speech and visual impairment against a background of the patient's age and environment. Upper extremity assessment measures joint positions, range and power of movement, sensation and limb function utilising established grading scales (figure 3).

Fig. 3: Assessment



## SPLINTING

Splinting is used as an adjunct to surgery as shown in table V:

Table V Splinting

- Facilitation of surgical correction of flexed wrist by preoperative splinting
- Post-operative removable splints for the wrist, digits and thumb to be worn between exercises.
- Protection of the biceps tendon after lengthening
- Protection of external rotation transfer at the shoulder

## SURGERY

The mainstay of management is surgical. The common procedures used are summarised below (table VI), but the actual surgical plan may vary considerably depending on a patient's individual clinical picture and operative findings. The reader is referred to a separate publication for an account of the basis of the procedures performed<sup>8</sup>. In general the elbow, wrist and fingers are treated together. The thumb may be treated at a second stage. Musculotendinous junction lengthening is preferred over tendon releases to preserve muscle function.

### References

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### Abbreviations

- AP adductor pollicis
- APL abductor pollicis longus
- B brachialis
- BR brachioradialis
- ECRB extensor carpi radialis brevis
- EDC extensor digitorum communis
- EPB extensor pollicis brevis
- FCR flexor carpi radialis
- FDS flexor digitorum superficialis
- PT pronator teres
- 1st DI first dorsal interosseous

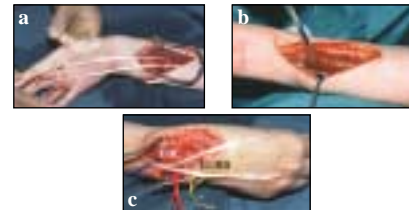


Fig. 4: Intraoperative transfer of FDS for wrist and digital extension. A: Harvested FDS tendons (the finger approach for simultaneous FDS tenodesis is shown). B: Tendons passed through the interosseous membrane. C: Tendons in the extensor compartment in preparation for weave to the ECRB and EDC proximal to the extensor retinaculum.

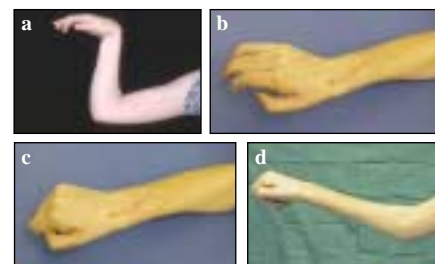


Fig. 5: Preoperative posture and early postoperative results of the patient shown in figures 4. Digital extension and flexion with preservation of wrist extension, elbow extension.

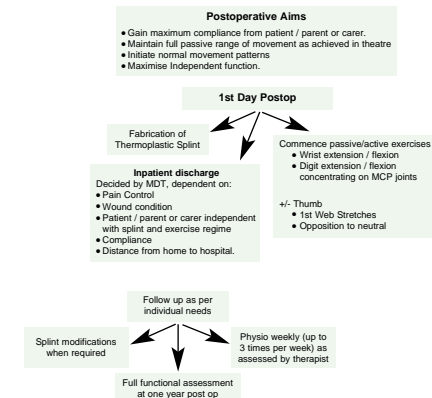
Table VI: Surgical Protocol

• Shoulder	Surgery rarely required. Subscapularis origin release External rotation transfer
• Elbow flexion contracture	Biceps step-lengthening BR & B musculotendinous lengthening
• Forearm pronation contracture	PT rerouting
• Wrist flexion deformity	FCR / FDS to ECRB Musculotendinous lengthening of flexors
• Digital flexion deformity	FDS to EDC Musculotendinous lengthening of flexors
• Thumb-in-palm deformity	AP and 1st DI release Tightening of APL and EPB First web release with z-plasty/local flap
• Swan-neck deformity	Correction of wrist +/- FDS tenodesis
• Dyskinetic CP	Joint stabilisation procedures

## POST-OPERATIVE MANAGEMENT

On the first postoperative day a removable thermoplastic splint is applied to the wrist and/or first web. Active and passive exercises commenced (figures 7 and 8). This regimen is continued for four weeks.

Fig. 6 Postoperative care



The elbow is immobilised for four weeks.

Patients are monitored in by the multidisciplinary team throughout recovery, and at 12 months following surgery a repeat full assessment is carried out.

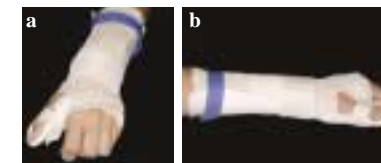


Fig. 7: wrist and thumb removable splint

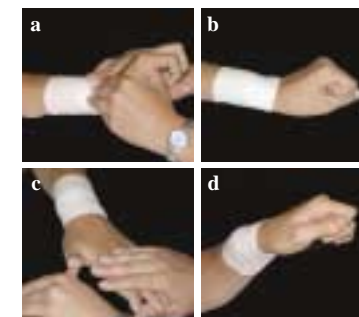


Fig. 8: Early mobilisation. A wrist passive extension, B active extension, C thumb passive extension, D active extension