Adaptive shortening of long flexor in patients with claw hand: A short report

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Summary Adaptive shortening of long flexors is the common secondary impairment which can occur in patients with long standing claw hand, particularly in those who do not undergo any supervised physiotherapy programme.1 The main purpose of this short report is to describe the current physiotherapeutic means which are commonly employed for the management of long flexor tightness. This report further gives an insight into the consequences of the delay in corrective surgery and ultimately describes the dire need for further research on this deformity.

Adaptive shortening of the muscles is a phenomenon which can occur for many reasons, like prolonged immobilisation of the body segment, postural imbalance, muscle imbalance, impaired muscle performance due to neuromuscular problems or may be due congenital and acquired deformity.2 Tightness of the muscles leads to limitation of joint range of motion.3 In leprosy the cause of adaptive shortening of the long flexors is muscle imbalance which occurs due to paralysis of the ulnar nerve at the elbow joint. Adaptive shortening of the muscles is a secondary impairment.4 Secondary impairments have multidimensional effects on the management of the deformity, including delay in surgery for the correction of deformity which in turn is responsible for the unemployment, social stigma and problems in social integration.5 Secondary impairment in some way or other is responsible for the above stated problems, but adaptive shortening of the long flexor (long flexor tightness) is important because sometimes months of therapy are required to attain full muscle length.

CURRENT PHYSIOTHERAPY EXERCISE PROGRAMME FOR THE MANAGEMENT OF THE LONG FLEXOR TIGHTNESS

As there is no objective grading of the adaptive shortening of the flexor muscles at present the deformity is therefore categorised as ‘mild’, ‘moderate’ or ‘severe’, and these subjective categorisations of the shortening of the muscles vary from one clinician to another. For most of the patients with isolated long flexor tightness following exercises are taught:

1. Self-stretching of the muscles by the patient in one of the following ways:
   a. Self-stretching by the patient himself: patient standing with the affected hand placed on a table top with his shoulder adducted, elbow extended, wrist joint, metacarpophalangeal joint and proximal and distal inter-phalangeal joints extended and
maintaining the position by the other hand being placed on the affected hand for at least 20 to 30 seconds initially and then progressing to 2 to 3 minutes.
b. Self-stretching by the patient himself: patient standing by the side of a wall abducting the shoulder to 90 degrees and then extending the elbow, placing the extended wrist with palm on the wall with proximal and distal inter-phalangeal joint in extension maintained with the help of the normal hand.
c. Self-stretching by the patient sitting on the palm facing the ground and dorsal aspect of the hand under the thigh proximal and distal inter-phalangeal joint extended for 3 to 4 minutes.
d. Self-stretching by the patient by flexing the shoulder to 90 degrees and maintaining the elbow extension and wrist extension along with proximal and inter-phalangeal joint extension with other hand for 10 to 20 seconds.
e. Self-stretching by the patient: in this the inter-phalangeal joint is maintained in extension by means of orthosis and while elastic stretches the wrist into extension.6
f. Static stretching by means of serial plaster of Paris (POP) casting, a volar slab is made extending from the finger tips to just below the elbow. The fingers should be maintained in extension at the proximal inter-phalangeal joint. This serial cast, if changed on a weekly basis regularly, with the therapist gradually extending the wrist, then growth in the shortened muscles can be achieved7 (Figures 1–4)
SURGICAL METHODS FOR CORRECTION OF THE INTRINSIC DEFORMITY OF THE HAND

Fascia and aponeurotic release is described in the literature. But what is not well described in the literature is how to differentiate between tightness in the muscles and fascia; rather fascia and aponeurosis are being described as the non-contractile tissue. Musculiono described that fascia as more like a contractile tissue. Therefore, keeping pace with current research, it is very important that the adaptive shortening of the long flexors in claw hands should be redefined.

QUANTITATIVE METHODS OF MEASURING LONG FLEXOR TIGHTNESS AS DESCRIBED IN LITERATURE

1. As per Brandsma, torque angle measurement can objectively assess the degree of adaptive shortening of extrinsic finger flexors. Torque angle measurement as per Brand is described as “windows into the mechanics of the joint”.

2. Adaptive shortening of the long flexor is defined as the angle at the PIP joint with the wrist kept in neutral, 30 degrees of extension and 60 degrees of extension. The presence of long flexor contracture was thus verified if the PIP joint kept extended passively, began to flex as the wrist was extended beyond neutral.
But the validity and reliability of these methods for measurement is not being established and these methods are not being used in any clinical studies for the measurement of long flexor tightness. Further, Brandsma in fact suggested that there is need to develop a method for the quantitative measurement of long flexor tightness.1

PRESENT SCENARIO OF CONSERVATIVE MANAGEMENT OF ADAPTIVE SHORTENING OF LONG FLEXORS

If a case/subjects present with ulnar claw hand deformity the clinician does the examination for long flexor tightness as described in the literature6 and decides whether the subject has long flexor tightness or not. Further, the severity of long flexor tightness is also being described subjectively as ‘mild’, ‘moderate’ and ‘severe’, but this quantification of long flexor tightness is subjective and may vary from clinician to clinician.

After it has been agreed that a person has long flexor tightness, the above-described methods are followed as per the protocols and the surgeons’ and therapists’ own experiences. These protocols concerning the frequency of self-stretching and use of static stretching by means of the volar slab may vary from hospital to hospital and depend mainly on past experience as there is no set and defined protocol for the management of long flexor tightness. Further, as quantitative measurement is only subjective, it is not possible to state clearly how many physiotherapy sessions or days of physiotherapy will be required to stretch the long flexors, and this is very confusing and dissatisfying for the patient because he cannot decide how much leave he has to take from work and when he will be ready for surgery.

Discussion

In the absence of an objective method of quantifying long flexor tightness and no guidelines regarding the therapy programme for the management of flexor tightness, it becomes very difficult and problematic for a clinician to decide which therapy programme needs to be followed, especially as there are no guidelines regarding the approximate amount of time in days that will be required to correct this secondary impairment. Because of all this, sometimes the patient who is willing to undergo surgery becomes confused as to why he is being rejected from surgery while others were selected. Furthermore, he is also often in doubt regarding taking leave from his job, so all these factors may sometimes demotivate the patient from undergoing surgery.

Also, with the absence of proper guidelines regarding decision making for surgical correction it becomes difficult for the clinician to decide whether or not to opt for surgical correction.

Conclusion

At present guidelines regarding the assessment and management of the adaptive shortening of long flexors is subjective and varies from one centre to other and from one clinician to another. Further, because of the lack of objective assessment of adaptive shortening it becomes difficult for the clinician to clearly formulate a therapy programme for the management of the condition and also to answer queries from the patients regarding the
length of stay in hospital and the tentative date of surgery, and these factors may sometimes
demotivate the patients to undergo surgery. Therefore, it will be better if some reliable and
valid method could be developed for the objective measurement of adaptive shortening of
long flexors and the protocol of the management of the adaptive shortening.

Future research recommendations

1. Reliable and valid methods for the quantitative measurement of adaptive shortening.
2. Protocols for the management of adaptive shortening either by means of surgery or
   therapy.

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