CEREBRAL PALSY AND THE BOBATH TREATMENT.

by

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1. Diagnosis.

Severe cases of cerebral palsy, presenting with pronounced abnormalities, are only too common. A palsy from cerebral causes can, however, be very mild – presenting mainly as clumsiness or lack of full motor development, with or without mental retardation. In such cases precise diagnosis can be difficult and various conditions have to be considered. Cerebellar defects present as clumsiness. Some children are slow to walk and to speak and slow to learn complex motor activities due to mental deficiency. A somewhat similar condition is occasionally encountered in children of normal mentality with no signs of cerebral palsy – to this is given the name "congenital maladroitness".

The diagnosis of Cerebral Palsy is a clinical and not a pathological one. Various types of cerebral palsy, e.g. diplegia, hemiplegia, choreo-athetosis etc., are all clinical concepts each of which can be seen with various neuropathological conditions.

Accurate clinical diagnosis and assessment, together with response to treatment and the end result of such treatment, is important; not only from a purely clinical point of view, but also with a view to correlation with neuro-pathology and as a basis for further research work and development of newer therapeutic methods. From such careful clinical appraisal, the Bobarth Treatment for example developed.

On the pathological side, brain biopsies are more often undertaken nowadays and gradually information is being accumulated which may later aid in more accurate diagnosis and one hopes, in more specific treatments.

An interesting newer field, is the study of abnormalities in chromosomes or chromosomal patterns. This work is also being done in Pretoria and a project for the future is the study of the chromosomes in cerebral palsy. It is already well known that conditions such as Mongolism and the Klinefelter syndrome, are most probably due to an abnormal number of chromosomes.

2. Physiology.

In the second place, I wish to mention briefly some of the Neuro-physiological factors involved in cerebral palsy. The accent in cerebral palsy is apt to be on the motor abnormality, and with this in mind, we are often inclined to split up motor function into so-called component parts and even to speak of higher and lower levels of motor function, forgetting sometimes that normal motor function is one perfectly integrated whole in which no level is higher or lower in importance or effect, as every part of the motor system is necessary for normal function, each playing its part as required. Furthermore no motor system can function efficiently without a sensory input and the sensory input may be regarded as the most important factor in motor function, whether this be in the spinal cord or in the physical sphere.

For purposes of description, however, we must divide up the nervous system and speak of various functional systems.

(a) Cortical.

We all know the importance of the sensori-motor area of the cortex in discreet actions or movements. The exact functions of the various cortical layers are still not known and although a great significance has been attached to the large Betz cells in the fifth layer as origin of the so-called pyramidal tract, we know today that these cells alone cannot account for all pyramidal fibres and functions.

Many other cells in the sensori-motor area take part in the formation of the pyramidal tract, and these different types of classes of fibres from the cortex, have slightly different functions. Two of these, for

example, are the alpha motor pathways and gamma motor pathways from the cortex supplying impulses to the alpha and gamma motor efferents to muscles via the anterior horn of the spinal cord. The activity of these systems depends on cortical and subcortical activity. It was found that the cortex as a whole, not only possesses a potential excitability, but that it is probably at most times in a varying state of inhibition. This cortical inhibition may be altered by various routes, one of which, e.g. is thought to function as a feed-back system from the cortex, through the basal ganglia and thalamus back to the cortex by which means the state of cortical inhibition can be increased or diminished, depending most probably on the rate of discharge by the feed-back circuit. This feed-back circuit is in its turn influenced by other circuits from the basal ganglia, the reticular formation, the cerebellum, the vestibular apparatus, and the spinal nerves and the muscles.

An example of extreme cortical inhibition is to be found in many cases of post-epileptic paralyses, where the inhibitory effect may be so strong as to cause temporary complete paralysis of a limb or limbs. The importance of the state of cortical inhibition lies in its effect on muscle tone as well as its effect on phasic contractions.

(b) Reticular System.

One of the most important mechanisms in motor effect is the reticular system of the brainstem, which by its wide spread afferent connections and its diffuse projections to the cortex via the thalamus, plays an extensive role in all motor functions. Cerebellar effects on motor function are in part exerted through fibres from the Purkinje cells which pass to the reticular substance. The frequency of impulse formation is thought to cause either facilitation or inhibition. Probably slow rhythmical impulses cause inhibition. When cortical inhibition is diminished, more alpha motor neurone firing occurs, so that the balance balance between alpha and gamma effect is disturbed and increase of muscle tone then results. Such conditions may occur in Parkinsonism, e.g. where due to loss of function of the substantia nigra, less modulating effect is exerted on the feed-back circuit, increased speed of impulse formation passes through the thalamus, decrease in cortical inhibition and therefore, relative increase in alpha motor effect occurs with resultant increase in muscle tone.

I may add here that the substantia nigra, nucleus Ruber and corpus subthalamicum are regarded by some merely as specially developed parts of the reticular system.

Not only does this system have its effect on the basal ganglia, thalamus and cortex, but it also has a more direct effect on spinal functions and especially on muscle tone. Its effect is most probably in the region of the internuncial neurone rather than on the anterior horn cell itself. The vestibular influences on spinal functions are to a large extent dependant on the close connections with the Reticular System.

(c) Spinal Cord.

In the spinal cord we find the continuation of the reticular system, where again it plays an important part in facilitation and inhibition. In traumatic paraplegia for example, it is thought that due to the local abnormalities, artificial synapses are formed, so that afferent impulses in the region of the injury are easily transmitted causing reticular facilitation and therefore, resulting in spasticity. Because of the inhibition or facilitation that can probably originate in the cord itself, a second transection of the spinal cord can increase spasticity, by increasing local facilitation.

(d) Muscles.

We have recently read more and more about the effect of the gamma system on muscle tone. This gamma system depends on so-called muscle spindles in between and parallel to the other muscle fibres, which function as indicators of change of muscle tension. Through sensory afferents from these spindles, different degrees of facilitation of the anterior horn cells and the alpha motor efferents are effected, causing change in muscle tone. These muscle spindles are in their turn supplied by special gamma efferent fibres by means of

which their own tension and therefore sensitivity, can be altered.

Summary.

From this short discussion on some aspects of neuro-physiological function, one realises that the nature of normal function is still very obscure and that abnormalities are therefore very difficult to explain. It is, however, the abnormalities that necessitate treatment, and if is from clinical observation of abnormal function and the manner in which normal and abnormal function can be influenced, that the Bobarth treatment was evolved.

Opsomming.

Uit hierdie kort bespreking oor 'n paar aspekte van neurofisiologiese funksies, is dit duidelik dat die aard van normale funksies nog steeds baie onbekend is en daarom is abnormale funksies baie moeilik om te verklaar. Dit is egter vir die abnormaliteite wat vehandeling nodig is en uit kliniese waarneming van die abnormale funksies en die manier waarop normale en abnormale funksies beinvloed word, het die Bobath-behandelingsmetodes ontstaan.