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MOTOR RECOVERY IN CHILDREN WITH CEREBRAL PALSY; SENSORY MOTOR APPROACHES OF TREATMENTS

SEREBRAL PALSİSİ OLAN ÇOCUKLARDA MOTOR İYİLEŞME; DUYUSAL MOTOR TEDAVİ YAKLAŞIMLARI

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Abstract

Cerebral palsy is a problem of movement and posture and caused by lesion in immature brain. Normal brain has normal influences on lower centers and normal development in movements and postures. There are different sensory motor approaches like Bobath, Brunnstorm, Rood and PNF (Properioceptive Neuromuscular Facilitations) in recovery of motor function in patients with upper motor neuron lesions. The backgrounds of these treatments can be explained by different theories like neurodevelopmental theory, reflex theory, hierarchical theory and system approach. Repetitions of normal movements generate the new areas in the brain to control the activities. Integration of reflex activity should be essential part of rehabilitation and physical development of children with cerebral palsy.

Keywords: cerebral palsy, motor control, reflexes, movement, neurodevelopmental, hierarchical, system theory

Özet

Beyin felci hareket ve duruş problem olmak birlikte olgunlaşmamış beyindeki lezyondan dolayı oluşur. Normal beynin alt merkezlerde normal etkileri vardır ve hareket ve duruşta normal gelişim gösterir. Üst motor nöron lezyonlu hastalarda ki motor fonksiyonun iyileşmesinde Bobath, Brunnstorm, Rood ve PNF (Propriyoseptif Nöromüsküler Fasilitasyon) gibi farklı duyusal motor yaklaşımlar vardır. Bu tedavilerin zemini nörogelişimsel teori, refleks teorisi, hiyerarşik teori ve sistem yaklaşımı gibi farklı teorilerle açıklanabilir. Normal hareketlerin tekrarını sağlamak, faaliyetleri kontrol etmek için beynin yeni alanlarını oluşturur. Refleks aktivitesinin entegrasyonu, beyin felci geçiren çocukların rehabilitasyonu ve fiziksel gelişiminin önemli bir parçası olmalıdır.

Anahtar Kelimeler: *beyin felci, motor kontrol, refleksler, hareket, nörogelişimsel, hiyerarşik, sistem teorisi*

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1. Introduction

Cerebral palsy is a problem of movement and posture and caused by brain lesion in immature brain (Afza, Manzoor, & Afzal, 2017). Children with cerebral palsy show different sensory motor impairments and delay in motor development (Yoshida et al., 2010). Cerebral palsy can occurred during the birth, before birth in gestational period and after the birth (Levitt, 2013). Brain is highly sensitive tissue that cannot tolerate oxygen deprivation for seconds (Larson, Drew, Folkow, Milton, & Park, 2014). Oxygen deficiency and prematurity are considered leading cause in cerebral palsy (MacLennan, Thompson, & Gecz, 2015). Pregnancy disorders, home delivery, traumatic brain injury and neonatal infections are also contributing factors (MacLennan et al., 2015).

2. Normal Motor Development

Normal brain has normal influences on lower centers and hence normal development in movement and postures (Fig.01) (Illingworth, 2013).

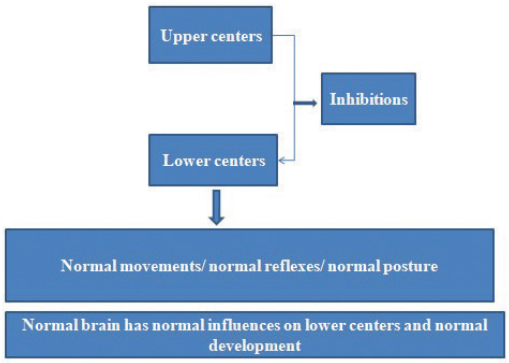

Figure 1: Normal development in normal brain

3. Abnormal Motor Development

Children with cerebral palsy have abnormal development of movement and posture due to abnormal reflexes activity (Illingworth, 2013). At the time of birth baby have reflex activity and with the time this reflex activity is controlled by brain. But in cerebral palsy upper centers did not inhibit the lower centers that resulted in exaggerated effects on muscle tone (fig.02) (Afza et al., 2017).

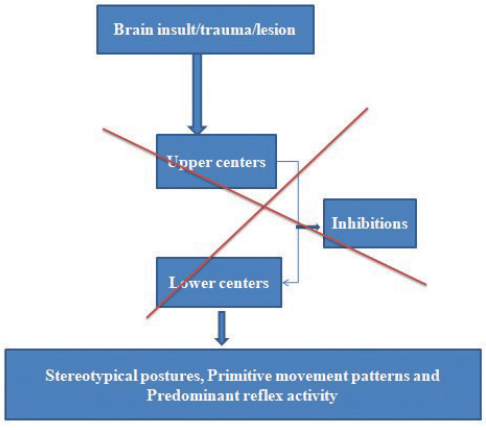

Figure 2: Abnormal influence from lesion (abnormal) brain

4. Approaches In Motor Recovery

There are different sensory motor approaches like Bobath, Brunnstorm, Rood and PNF (Properioceptive Neuromuscular Facilitations) in recovery of motor function in patients with upper motor neuron lesions (Koleva, Yoshinov, & Yoshinov, 2016). The back grounds of these treatments can be explained by different theories like neurodevelopmental theory, reflex theory, hierarchical theory and system approach (Bhalerao et al., 2013).

5. Neurodevelopmental Modal

According to neurodevelopmental modal, motor control can be explained under open and close loop system (Afza et al., 2017). Body has two types of control; one is voluntary and second is postural control system (Horak, 2006). Postural control is automatic and reflexive and develops after the maturation of upper motor center (Van der Helm, Schouten, de Vlugt, & Brouwn, 2002). At the time of birth, body did not have voluntary control and every movement is reflexive (Thelen, 1985). At the age of 06 months, most of the reflexes are integrated and body starts working voluntary (Fig.03) (Fiorentino, 2014). In cerebral palsy, reflex activity remains continue due to lesion in brain, that's why most of movements are automatic and voluntary control does not efficient, that leads to abnormal movement patterns and abnormal synergies (Ozmun & Gallahue, 2016). To develop the control in children with cerebral palsy, inhibition of abnormal movements and facilitation of normal patterns should be practice (Levitt, 2013).

This modal can help in management of patients with cerebral palsy or patients with other movement disorders like stroke. After a brain lesion, weather in immature brain (cerebral palsy) or in a mature brain (stroke), goal should be to minimize the involuntary reflexive activity and there should be maximum postural control.

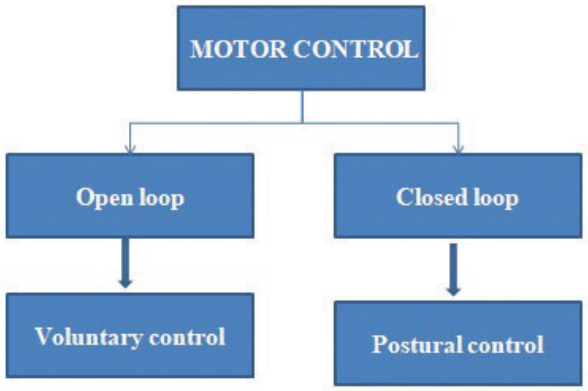

Figure 3: Neurodevelopmental modal

6. Reflex Theory

According to reflex theory, reflexes make the background of purposeful movements (Cano-De-La-Cuerda et al., 2015). At initial months of life body is crude level and there is automatic involuntary control of movements. With the age, reflexes are integrated and purposeful movements are developed. When there is lesion in abnormal brain, there is re emergence of reflex movements. In adult

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stroke, body again comes under the control of reflex activity and upper brain center does not inhibit the lower centers. There is increased tone, hyper reflexia and exaggerated deep tendon response.

7. Hierarchical Theory

According to hierarchical theory the motor control is on upper, middle and lower levels and movements can be classified into upper, middle and lower (Uithol, van Rooij, Bekkering, & Haselager, 2012). Higher center control and regulate the lower and middle levels. Damage to upper centers lead to disruption of normal motor control.

8. System Approach

System approach explained that there is no strict control of higher centers on lower centers and there is mutable relationship between the various levels (Afza et al., 2017).

All these theories are basis of sensory motor approach to develop motor control in children with cerebral palsy and in adults with stroke. In cerebral palsy brain lesion occurred before development of normal movements patterns and in stroke brain lesion occurred in mature brain (Kirton, 2013).

9. Conclusion

In cerebral palsy actual problem is with pattern of normal movements. Due to influence of abnormal tone the abnormal movements develop in body. If children with cerebral palsy are trained with inhibition of abnormal reflex activities and facilitation of normal patterns, then brain can be train with normal activities. Repetitions of normal movements generate the new areas in the brain to control the activities. Integration of reflex activity should be essential part of rehabilitation and physical development of children with cerebral palsy.

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