

Early intervention in obstetric brachial palsy: a review

Intervenção precoce na paralisia braquial obstétrica: uma revisão

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ABSTRACT

Obstetric brachial paralysis is the end of an injury to the nerve fibers of the brachial plexus during obstetric maneuvers during childbirth. The injury has a great impact on the functionality of the injured upper limb of the newborn. The signs and symptoms vary, depending on the location of the lesion. The early intervention of the physiotherapist in the rehabilitation process is essential to prevent complications and improve motor function. Physiotherapeutic treatment has a very important contribution to the rehabilitation of children with obstetric brachial palsy, however, it is important to respect the neuropsychomotor development process normal child. The physiotherapy objectives basically consists on avoiding contractures and adhesions; promoting motor and sensory stimulation; maintaining range of motion and functional training. Among the techniques that these professionals have, we can highlight passive and active kinesiotherapy,

electrostimulation, proprioceptive stimulation, hydrotherapy and Movement Induction and Containment Therapy (MICT), always creating the best possible conditions for the recovery of this individual's functional capacity.

Keywords: Obstetric palsy, Brachial plexus, Early intervention, Physical Therapy.

RESUMO

A paralisia braquial obstétrica é o fim de uma lesão nas fibras nervosas do plexo braquial durante manobras obstétricas durante o parto. A lesão tem um grande impacto na funcionalidade do membro superior ferido do recém-nascido. Os sinais e sintomas variam, dependendo da localização da lesão. A intervenção precoce do fisioterapeuta no processo de reabilitação é essencial para evitar complicações e melhorar a função motora. O tratamento fisioterapêutico tem uma contribuição muito importante para a reabilitação de crianças com paralisia braquial obstétrica, porém, é importante respeitar o processo de desenvolvimento neuropsicomotor normal da criança. Os objetivos da fisioterapia consistem basicamente em evitar contraturas e aderências; promover estimulação motora e sensorial; manter amplitude de movimento e treinamento funcional. Entre as técnicas que esses profissionais possuem, destacam-se a cinesioterapia passiva e ativa, eletroestimulação, estimulação proprioceptiva, hidroterapia e Terapia de Indução e Contenção de Movimento (MICT), sempre criando as melhores condições possíveis para a recuperação da capacidade funcional desse indivíduo.

Palavras-chave: Paralisia obstétrica, Plexo braquial, Intervenção precoce, Fisioterapia.

1 INTRODUCTION

Obstetric Brachial Palsy (OBP) is defined as an injury that occurs through traction or compression generated in the brachial plexus as a result of maneuvers during childbirth, which affects the upper limb of newborn babies, thus, OBP it can be classified into three: Erb-Duchenne's palsy, Klumpke's and total palsy. OBP can cause a delay in neuropsychomotor development, it is essential to have an early intervention, using some techniques and activities to favor gains in the acquisition of neuropsychomotor stages, the physiotherapy sessions aim to prevent contractures and deformities, perform the correct arm positioning, provide guidance to parents on how to handle the affected member of this child correctly¹.

The diagnosis of OBP is essentially neurological and clinical and can be performed soon after birth. It is recommended to wait three weeks to define the clinical picture, bringing information on the types of lesions¹. It is essential that the treatment of paralysis starts early, even with a few days of life, it is possible to start with smooth movements, and also orientations, regarding positioning, to be preventing deformities, gaining muscle strength, motor coordination, grip, thus improving the quality of life of these children².

The treatment of OBP can be performed with surgery for plexus reconstruction, and correction of secondary deformities, in addition to physical therapy rehabilitation. Physical therapy has a very important contribution in the rehabilitation of children with OBP, however, the normal neuropsychomotor development (NPMD) process of this child must be respected. Therefore, it is necessary to characterize the importance of early intervention in obstetric brachial palsy³.

The physical assessment of the NPMD, the child is observed in different postures, making use of assistive technology regarding the base, postural or movement tone, presents deformities, reflexes, associated reactions, location and distribution of weight, postural changes, protective and balance reactions, motor skills, range of motion, symmetry, limb positioning, basic reach, grip and handling skills, muscle strength and sensitivity⁴. The diagnosis of OPB is essentially neurological clinical and can be performed soon after birth. It is recommended to wait three weeks to define the clinical picture, bringing information on the types of lesions¹⁻⁴.

This review, whose search strategy includes scientific articles from journals available in the electronic databases BIREME, LILACS, SCIELO, PUBMED, and targeted publications that addressed early intervention as a physical therapy treatment. To search for publications, the following terms were used: “brachial palsy”, “early intervention” and “physical therapy”.

Each one of the cited databases showed a reference list of 153 eligible studies that were reviewed, including those 22 studies that matched the inclusion criteria: were published in Portuguese or English after the year of 2016 and were related to early intervention or physical therapy methods used to treat brachial palsy, and excluded those 118 that contained unrelated topics and those 13 studies that were duplicated.

Pathophysiology

Brachial plexus injury occurs by compression or traction, as a result of trauma to the shoulder, during pre and postpartum, and is commonly linked to complications during childbirth, generating interruption of sensory and motor impulses. Most authors believe that OBP is produced by stretching the brachial plexus during childbirth. This stretch would usually be produced by the difficulty in releasing the shoulder. The tension gradient generated would be greater for the upper trunk and lower for the lower trunk, which explains the distribution of clinical forms⁴.

The brachial plexus injury can result from a neck flexion, with fixed shoulder or also by longitudinal arm traction, which explains the preferential involvement of the trunk.

The finding that OBP is associated with abnormalities in the second stage of labor has led some obstetricians to postulate that maternal propulsive forces could cause the plexus to stretch. Obstetric Brachial Palsy is related to both a prolonged second stage and “ultra-short”³. There would also be deficient rotation of the fetus, leading to the alignment of the shoulder axis with the anteroposterior diameter of the pelvis. Some OBP patterns are incompatible with the shoulder depression stretch theory. Klumpke's palsy could be related to arm hyperabduction in breech deliveries, and an intermediate form would be related to the traction of the shoulder in the anteroposterior direction⁴.

Total plexus injuries would also be incompatible with the shoulder depression mechanism, as avulsions restricted to the roots are often observed C₈ and T₁, and avulsions are more common at the lower level of the plexus; however, the most likely explanation is that spinal nerves at these levels do not have the connective anchorage of the transverse processes of the cervical vertebrae⁵.

Peripheral nerves have a limited spectrum of pathophysiological changes in face of different types of traumatic injuries, including injuries by traction or compression. Pathophysiological changes can be graded according to different classifications. The most used pathophysiological classification for traumatic injuries divides them into neurapraxia, axonotmesis or neurotmesis⁴⁻⁵.

Classification

The classification of brachial plexus injury is described according to the anatomical structures involved and needs to be done no earlier than 48 hours after birth, so a more specific exam, and also the test to assess muscle function, can be performed to help differentiate the types of patterns or paresis that are related to this injury⁶.

Three forms of paralysis due to obstetric brachial plexus injury are classified, according to the level of injury. Erb-Duchenne's Palsy is the most common type where the upper trunks (C5 and C6) are affected resulting in paralysis of the shoulder and upper arm. Klumpke's Palsy affects the lower trunks of the brachial plexus (C8-T1) causing paralysis of the muscles of the forearm and hand. On the other hand, Complete Brachial Palsy causes loss of sensation and complete paralysis of the entire upper⁴.

Erb-Duchenne palsy: affects the muscles innervated by the C5 and C6 roots of the brachial plexus. It is the most common form of brachial palsy and is characterized by unilateral Moro reflex response, shoulder drooping, affected arm in adduction, immobile, internally rotated at the shoulder and with pronation at the level of the elbow. The wrist is presented in dorsal extension, with the palm tending to face upwards. As a differential diagnosis of brachial palsy, the epiphyseal displacement of the humerus and its site of greatest incidence should be considered⁶. A consequence of humeral and clavicle fractures may eventually present with those of OPB.

Klumpke's palsy affects only hand muscles innervated by fibers from the C8 and T1 roots. In this case, the hand remains in pronation, with the fingers flexed and reflex grip absent. Sympathetic fiber involvement from the T1 root that may be present results in Horner's syndrome, with eyelid ptosis, miosis, and lack of iris pigmentation in the eye on the injured side⁴.

Total brachial palsy consists of when there is involvement of the entire plexus, involving C5 to T1. All arm muscles are paralyzed, with either a marked decrease or absence of deep reflexes⁵.

Erb-Duchenne-type palsy has a generally good prognosis, with improvement between three and six months; Klumpke's palsy, on the other hand, has a poor prognosis, being that of total brachial palsy poorly. In severe cases, and even in mild cases, when possible, electromyography will be useful in diagnosing the severity of the lesion, prognosis and follow-up⁶.

The location and distribution of motor paralysis will depend on the location and nerve damage. Some problems can be associated with brachial plexus injuries, as they are related to birth trauma, such as torticollis, facial paralysis, clavicle or humerus fracture, shoulder subluxation or diaphragm hemiparalysis. Therefore, it is necessary to carry out an in-depth study of the case in order to have the correct diagnosis⁵.

Characteristics

It is noted that first the affected limb is in a “let go” attitude, and then ends up in semi-flexion of the elbow, adduction of the shoulder and flexion of the hand. Diagnosis is made soon after birth, due to the presence of paralysis, with loss of movement in the upper limb, and can also be evaluated by the loss of deep reflexes and asymmetry in Moro reflexes and cervical torsion⁷.

Peripheral injuries can lead to some sensory losses, causing pain and discomfort, and also motor losses that cause paralysis, resulting in muscle atrophy, being the most drastic cause in peripheral nerve injuries, also changes in the map somatosensory⁸.

The most common associated injuries are: hypoxia, facial or phrenic nerve palsy, humerus fracture, clavicle fracture or cervical fracture, shoulder dislocation and torticollis. Once the diagnosis of obstetric brachial plexus palsy is made, it is imperative that the anatomical location is made and the severity of the lesion measured, as this will determine the prognosis of possible recovery³.

The lesion is clinically characterized by favoring motor and sensory damage to the baby's upper limb, which occurs at the time of delivery. Due to its anatomical location, the brachial plexus can suffer several trauma mechanisms through traction and compression modes. The more energy the trauma has, the more extensive the injuries and structures involved, such as vessels, tendons and bones, all brachial plexus injuries can present more than one classification simultaneously, which can be divided into open, closed (traction), after radiation and perinatal⁸.

Brachial plexus nerve damage interrupts signals from the brain to the upper limbs, preventing the muscles of the arm, forearm and hand from functioning properly. Depending on the extension and severity of the lesion, the clinical picture presented by the patient may be milder or more severe⁹.

There are different types of injuries that vary according to the amount of injured nerves and the type of injury, which can be complete, partial or transient. Minor brachial plexus injuries may recover completely or leave some mild sequelae; the process can take several months. The most serious injuries can cause permanent disability and generate sequelae in the affected arm⁷.

Outcomes

There may be the involvement of other morbidities associated with this injury, such as facial nerve palsy, humerus or clavicle fracture, shoulder dislocation, and may have contracture of the sternocleidomastode muscle that causes the torticollis. The main complications in these patients are changes in sensitivity, total or partial loss of limb movement, postural asymmetries, joint deformities, winged scapula, muscle imbalances and soft tissue retractions¹⁰.

OBP is associated with maternal complications, the most commonly described are birth canal lacerations, uterine atony with hemorrhage, pubic symphysis disjunction and,

eventually, uterine rupture, fetal complications are brachial plexus injuries and clavicle fracture and humerus, which may evolve to intrapartum or neonatal¹¹.

The evolution of obstetrical paralysis is very varied, and it will depend on the extent of the lesion's involvement, it is estimated that full spontaneous recovery occurs in around 1 to 18 months. There are two changes that lead to poor recovery, they are Horner's Syndrome and Perescapular Muscle Paralysis. They indicate compromised root repair before the formation of the brachial plexus trunks, after nerve damage, phrenic nerve palsy also signals a poor prognosis⁹.

As a result of the pathology, some residual deformities can be observed (depending on the location, type and extension of the involvement), such as contracture in internal rotation, with shoulder adduction without joint deformity or dislocation; Contracture in internal rotation, with shoulder adduction showing joint deformity and posterior subluxation or dislocation; Contracture in external rotation, with shoulder abduction presenting subluxation or anteroinferior dislocation, Contracture in pure shoulder abduction; Flaccid paralysis of shoulder abduction and rotation with paralysis; Elbow flexion paralysis; Elbow flexion contracture Posterior dislocation of the radial head; Forearm deformity in pronation; Paralysis of hand muscles¹².

It is noted that the patient who had involvement of the entire brachial plexus or the inferior plexus presents a slower and more incomplete recovery than the one who had only the superior plexus affected. As soon as the affected limb is detected, it must be kept at rest with bandaging in adduction and medial rotation for at least three weeks to wait for the resolution of the acute reaction due to edema and bruises and the reduction of pain, after which exercises are indicated for the prevention of future retraction and the promotion of functional use¹³.

Treatment

- ***Physical Therapy Treatment***

OBP affects newborn babies at the time of vaginal delivery, so, from a physiotherapeutic point of view, it is important that treatment starts early to prevent the onset of adhesions and deformities, and consequently, sensory and motor changes, muscle shortening, decreased range of motion, helping to minimize the installation of sequelae. Monitoring by the physiotherapist professional becomes very important and essential for the proper reestablishment of the function and development of the limb which is affected by the injury¹⁴.

The main objectives of physiotherapy in the treatment of sequelae of brachial plexus injury are to create the best possible conditions for the recovery of functional capacity, to provide the necessary environmental conditions for the muscles to be able to resume their function, maintain or increase the range of motion of the affected limb, perform sensory stimulation on the affected limb, train transitions from sitting to the cat posture until the orthostatic posture, train motor control through exercises that encourage them to reach, grasp and manipulate objects¹⁵.

The initial treatment is conservative, consisting in immobilizing the newborn in a position to avoid vicious contractures and alleviate the pain caused by the movement of the injured upper limb. Thus, the abduction position in slight flexion and external rotation of the shoulder with the elbow flexed can be achieved by securing the newborn's shirt sleeve to a pillow placed in the crib, using only two hook pins¹⁶.

Care must be taken when performing this immobilization in hyperextension of the shoulder, as this would run the risk of scapulohumeral dislocation. Two to three times a day the immobilization must be removed to perform passive exercises of all shoulder movements¹⁷.

Thoracobrachial bandaging, such as Velpeau's, can also be performed with the hand placed on the opposite shoulder, remaining like this for two to three weeks and being changed frequently. In Klumpke's palsy, the hand will be kept in a neutral position of function, starting physiotherapy. The participation of the mother (or caregiver) is essential for the success of the treatment¹⁸. The person responsible for the care of the child should attend all sessions to learn handling techniques and postural adjustments. Physical therapy is of great importance in the recovery of children with obstetric brachial palsy, favoring a complete and equal range of motion in all joints of the affected limb, and also provides guidance to the country regarding home care for these children¹⁹.

Physical therapy goals basically consist on avoiding contractures and adhesions; promote motor and sensory stimulation; maintain range of motion and functional training. Among the techniques available to these professionals, passive and active kinesiotherapy, electrostimulation, proprioceptive stimulation, hydrotherapy and Restraint and Movement Induction Therapy can be highlighted, always creating the best possible conditions for the recovery of this individual's functional capacity¹³⁻¹⁶. Physical therapy can and should be started soon after diagnosis, in order to maximize the recovery of the affected limb. The newborn physiotherapy sessions can be structured in 4 moments: Posture correction / Passive mobilization / Arm positioning / Teaching parents¹⁷.

Arm positioning plays a fundamental role and should be taught to parents/caregivers, so that it can be performed throughout the days, even beyond the physiotherapy sessions. Four positions should be encouraged: Abduction with external rotation / Horizontal abduction with supination / Adduction / Internal rotation (only after the child turns 28 days old). Positioning should be implemented soon after diagnosis, during the day between feedings and also throughout the night. It is important to pay attention to the positioning of the injured upper limb during feedings and bathing to avoid worsening of the condition. The baby should always wear loose clothing if possible¹⁸.

- ***Early Intervention***

Early intervention is a resource in which activities are inserted that aim to stimulate the child's abilities as early as possible, and also to support the family and provide follow-up. way to minimize the problems related to neuropsychomotor development. The purpose of early stimulation is to facilitate the child's normal development. The objective of treatment by early stimulation, on the other hand, is to facilitate and correct abnormal development, minimizing the sequelae present in children's development, in certain pathologies¹⁹.

Intervention is understood as a variety of activities with the aim of stimulating the children's abilities as early as possible, supporting the family and providing follow-up on acquisitions. It is of paramount importance to prevent damage or harm to the development of children who need adequate stimulation during early²⁰.

Early physiotherapy shows a favorable improvement and will act with the objective of preventing joint deformities, reducing edema, improving muscle strength, guiding parents and stimulating the child's normal neuropsychomotor development. At the beginning of the treatment, passive movements of all joints will be performed. A widely used resource is hydrotherapy, but it can only be performed from one year of age onwards¹⁷.

Early physical therapy is important to prevent retractions that lead to osteoarticular alterations. In general, passive movement is used, initially carefully, to achieve goals, which will evolve into voluntary contraction, and consists on a fundamental process in rehabilitation to prevent deformities, promote gain in muscle strength, motor coordination, grip, functionality, and also independence, in order to obtain a better quality of life for children with OBP²¹.

It is important to highlight that obstetric paralysis depends on good prenatal care and delivery in order to prevent complications that, in most cases, are difficult to treat. Physiotherapeutic approaches become an immediate necessity after the diagnosis of PBO. In order to avoid deformities and monitor normal motor growth and development, it is essential to bring the function of the affected limb as close to normal as possible²².

Early Intervention refers to various activities with the aim of stimulating children's abilities as early as possible, supporting the family and offering follow-up on acquisitions. It is of paramount importance to prevent damage or harm to the development of children who need adequate stimulation during early childhood¹⁹.

2 CONCLUSIONS

Physiotherapy for OBP should be started early, as the child's treatment may show the return of functionality and activities more effectively, however, it is emphasized that even with early physiotherapy the benefits will be pointed out in accordance with the clinical classification, being high (Erb-Duchenne), low (Klumpke) and complete (Erb-Duchenne) palsy is the most common form (80% to 90% of cases) and has a better prognosis and greater physical therapy evolution. The Klumpke form is the rarest (5% or less), has a worse prognosis and less physical therapy evolution.

Therefore, the physiotherapeutic approach is of paramount relevance to the treatment of children with obstetric brachial palsy, as evidenced in the studies, results such as improvement in muscle strength of the compromised upper limb, improvement in movements, coordination / grip, functional gains and thus helping the child with better functionality and independence, in addition to providing general guidance to family members and caregivers about the proper care with the management of this child.

Even with the known and beneficial results of physical therapy on brachial plexus injuries in children, the number of studies that analyze physical therapy treatment is still inconclusive. What is suggested is the continuation of new research, practical studies that address the use of isolated physical therapy techniques and new approaches to the treatment of this clinical condition.

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