REHABILITATION PROGRAM FOR CHILDREN WITH BIRTH TRAUMA OF THE BRACHIAL PLEXUS

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Birth trauma of the brachial plexus is most often caused by difficult delivery of a large neonate. The data on the so-called obstetrical paralysis is scarce and controversial. In current life conditions and development of the medical science the number of children with plexus brachialis plexitis is supposed to decrease, but still this injury is present. The purpose of the study is analysing the results of the conducted complete one-year rehabilitation program for children with birth trauma of the brachial plexus, at the Clinic of Physical and Rehabilitation Medicine at the University Hospital Pleven. The study covers 24 children with the birth trauma of the brachial plexus, aged from 10-days old new borns to 13 years old children, who passed the complete rehabilitation program during the entire 2015; the program includes paraffin application, remedial massage, kinesitherapy, electrical stimulation, electrophoresis with Nivalin, labour therapy, occupational therapy and everyday life activities (for children over 5). Inquiry among parents, with open and standardized questions, is conducted. For good results from rehabilitation of children with the birth trauma of the brachial plexus the early diagnostics and initiation of the complete rehabilitation program are of crucial importance. Good results come hard and slowly, but the quality of life and work of the traumatized children is significantly improved.

Keywords: birth trauma, rehabilitation, everyday life activities, occupational therapy.

Introduction

Birth trauma of the brachial plexus is most often caused after hard delivery of a big infant, at breech presentation or other abnormal infant presentation, unsuccessful manipulations with forceps and vacuum extractors, narrow pelvis of the mother or raised tone of perineal muscles, congenital anomaly of infant’s spinal column etc. [1].

Data on frequency of Erb’s palsy are scarce and contradictory, and the reasons for this are explicable. According to the data provided by Gacheva, Y. (1982) the annual birth traumas in the country are between 320 and 380, which is 0,27% of all the newborns [1]. In present day conditions of life, with increased number of operative deliveries in risk pregnancies and the existing demographic collapse (annual decrease of number of newborns) we expect the decrease in number of infants born with the brachial plexus trauma. According to statistical data of the National Statistical Institute, in 2015 there were 66 370 children born in Bulgaria, but we haven’t found any statistics on the number of children diagnosed with the Erb’s palsy of the brachial plexus [7].

The fact that the brachial plexus is in close proximity to specifically moving structures of the shoulder girdle (fig. 1) is a prerequisite for traumatic injuries due to direct trauma (pressing) and stretching of nerve fibers in the area of the supraclavicular axilla (upper type injury), and in the area of axilla (lower type of injury) [3].

The disease is diagnosed mainly through anamnesis, applying various reflex and manual tests, and Rö-ography – to exclude other pathology (clavicle fracture) [1]. In order to establish the damage degree and the level of injury, in the context of the modern medical diagnostics, the EMG is produced.

The clinical picture is typical for peripheral paresis or upper limb paresis, depending on the severity and the level of injury. Two main types of upper limb dysfunction are distinguished: upper type (Duchen-Erb), lower type (Dejerin-Klumpke) and total type. The paresis causes full or partial immobility of the limb [2]. As the child grows up, all structures of the upper limb show the delayed development (muscle hypotrophy and hypotonia, shorter limb, often spinal bending – scoliosis to the direction of the parenthetical limb). With age significant difficulties in performing everyday activities appear, as well as the diminished capacity for work [10].

Neuropraxia (neuropaxia) is a lower level of injury; treatment is mostly conservative and is performed by a team of specialists. In severely traumatic conditions total disruption of axons or nerves is found (axonotmesis, neurotmesis) [3].

Along with medicament treatment (anti-swelling therapy, Nivalin – subcutaneously as per schedule etc.), it is very important to place the injured limb in suitable orthosis for the positional therapy. Main role in the treatment of such an injury is played by the physical and rehabilitation medicine; during the age periods of growing the means vary, being individually selected and dosed [8].

While growing, the child (especially in case of severe, total injury) is examined by an orthopedist, in order to detect possible corrective operative interventions to facilitate self-service skills and to improve the patient’s life quality. In 2012 Assoc. Prof. PhD M. Kateva, MD, head of the 1st Clinic of Traumatology at the „N.I. Pirogov“ University Hospital in Sofia, with the help of Prof. Edgar Bimer organized the first course on microinvasive neurosurgery on arms, including the early operative treatment of birth traumatized plexus brachialis. This was the beginning of new surgery for the world as well, and the aim was to save children with injuries on upper limbs that lead to full disability [12].

Objective of this study is analysis of results of a one-year complex rehabilitation programme for children with birth trauma of plexus brachialis, conducted in the Clinic of Physical and Rehabilitation Medicine at the University Hospital – Pleven.

Materials and methods

Twenty-four children with birth trauma of the plexus brachialis, aged between 10 days and 13 years (15 boys and 9 girls) are included in the study; the rehabilitation is conducted in the Clinic of Physical and Rehabilitation Medicine at the University Hospital – Pleven. From all monitored patients, 11 have injured right plexus brachialis, and 13 have...
the left limb injured. The diagnostics is performed through the clinical neuro-physiological test, based on transitional unconditional motor reflexes [1]. 16 children have Duchen-Erb type injury (upper + middle – C5,6,7,8 – Th1, 3 – Dejerin-Klumpke (lower type – C5,6 – Th1), and the rest 5 have total injury of plexus brachialis (C5,6,7,8 – Th1). The allocation of children in age groups (0–2 years old; 2–5 years old; over the age of 5) and the injury type are displayed on fig. 1. The graph shows the prevalence of traumas of the Duchen-Erb type, followed by total injury.

In compliance with the National Frame Contract for 2015 the Health Fund provides for a 10-day rehabilitation programme, following a clinical path relevant to the age of the children with birth trauma of the brachial plexus – 12 rehabilitation courses annually (each month) for children aged 0–24 months, 4 rehabilitation courses (each month) for children aged 2–5, and 2 rehabilitation courses annually for children over the age of 5 [6]. Grown up children with the Erb’s palsy can visit additional rehabilitation courses without limitations, but on ambulatory basis. The average number of completed rehabilitation courses (totally through clinical path and ambulatory) conducted over the one-year period we monitored is displayed on fig. 2; the children are allocated in age groups.

All children with the birth trauma of the brachial plexus participated in a complex rehabilitation programme for 10 consecutive days, dosed suitably for their age and that included: paraffin applications; healing massage; kinesiotherapy; electrical stimulation; electrophoresis with Nivalin; occupational therapy, ergotherapy (for children over the age of 5) [5, 9].

In order to register the level of recovery at the beginning and at the end of the monitored period, measurements and tests are conducted as per the injury type and children’s age. The children between 0–5 are centimeter-measured (measurements of a forearm, armpit and preserved length of the limb). With children over 2 various arm grips are tested (grabs – spherical, cylindrical, fist grip, hook grip) due to their lower type injury [4], and children with upper type of injury and over the age of 5 are tested through manual muscle tests of mm. rhomboidei (major et minor), m. supraspinatus, m. infraspinatus, mm. deltoidei, m. biceps brachii.

Because of the small number of children in the age groups as per type of injury, the results received have no statistical reliability, and this provoked us to do an inquiry (with open and standard replies) among the parents, having in mind the age of their children, so we could register the efficacy of the treatment.

Parents of 2-year old children replied to the following questions:
1. Do you understand the importance of systematic and active rehabilitation treatment, including treatment in home conditions?
2. Are you familiar enough with the supporting kinesiotherapeutic procedures for your child outside the medical centres?
3. Do you see improvement in movements of the injured limb?
4. Do you consider that your child falls behind in their physical development?
5. Do you have financial means to provide your child with treatment?

The questionnaire for parents with older children (aged over 2) contains additional questions:
6. Does your child go to a kindergarten?
7. Does your child cope with everyday life activities – toilet and personal hygiene, eating, dressing up and putting shoes on, other domestic activities?
8. According to your observations, does the child use the injured limb in everyday life activities or avoid using it?

Results and analysis

The centimeter measures of children up to the age of 2, at the beginning of the monitored period showed on average 0.5 cm hypotrophy of the injured limb (difference between the good limb, forearm and armpit) and preserved length of the limb. These results remain unchanged at the end of the one-year period. For the children up to the age of 5 the hypotrophy at the beginning of the study reached on average 1.6 cm,
the limb was shortened by 2.1 cm. For children over 5 the average results are respectively 2.3 cm hypotrophy and 3.4 cm shortened limb. At the end of the monitored period changes are difficult to be registered, which is explained by the common growth at this age. The grip test is made in age group 3 and 4 (4 children with total injury), and the average values are 3(+) for the first rehabilitation course for the year and 4(+) for the end of the monitored period. The results from the muscle tests of 6 children with upper type of injury, aged over 5, showed he improved condition of the tested muscles, but also a tendency for contractures in shoulder and elbow joints.

When analyzing the results of fig.2, we can summarize that for the 2-year old children the completed rehabilitation courses are extremely insufficient – on average 3,32 (27,1%), against the need and ability to complete the courses each month. The children from the second age group completed on average 3 rehabilitation courses, which is 75% from the 4 courses during the year they are entitled to. The fact is explained by the replies to the first question „Do you understand the importance of systematic and active rehabilitation treatment, including treatment in home conditions?“, to which 27% of the parents show hesitation in assessing the situation properly. This is also connected with the replies to the next question „Are you familiar enough with the supporting kinesiotherapeutic procedures for your child outside the medical centres?“, where the same parents gave similar replies. The fact calls for targeted work with the parents, because they are the adults supposed to accompany the children to the rehabilitation ward and be responsible for their health. Of crucial importance is training of the parents as to how to work daily with the child between the rehabilitation courses, to apply possible kinesiotherapeutic techniques and healing procedures, and with older children – sports activities or functional occupational therapy.

The children from the 3rd age group completed the optimum number of rehabilitation courses, but they were not sufficient enough for a better functional recovery.

The question „Do you see improvement in movements of the injured limb?“ received positive replies from all parents, especially in relation to smaller children with the upper type (neuropaxia). Re-innervation processes are observed after the age of 5-6, which confirms the need for systematic rehabilitation healing simultaneously with the growth [1].

The question „Does your child go to a kindergarten?“ received mainly positive replies from the parents, but they state the fact that the kindergarten staff is not qualified to stimulate and exercise the injured limb during the daily activities.

The replies to the question „Do you consider that your child falls behind in their physical development?“ are in all directions, though corresponding to the injury type and age of the child. The motor deficit has no consequences for the mental development, and the parents do not observe any delayed development. Parents of older children and those having children with the upper type of injury do not point out the substantial delay in physical development, but in cases of total injury and lower type of injury the lack of grip seriously impede the use of the upper limb in occupational and school activities, and this is reflected on the general physical development of the child.

As for the questions relevant to everyday life activities, the parents of older children also give various replies depending on the type of injury. In families where the child is being observed during the play time, remarks are made for the position of the limb and its use in all possible activities, etc., improved skills for self-service are found. Parents, who are not able to spend more time with their children and belittle the problem, point out that there are more difficulties in including the paretic limb in everyday activities.

The rehabilitation process is slow and extended. It depends on the parents’ responsibility and ability to accompany their children to treatment procedures, especially during the first months after birth. Some parents do not wish or cannot apprehend the crucial character of the problem and this inevitably affects the result. The parents must be convinced that major part in the complex treatment of birth trauma of the brachial plexus is the systematic rehabilitation. As per data from medical literature, about 25% of children with the upper type and neuropaxia, undergoing systematic physiotherapeutic and rehabilitation treatment, recover functionally [1]. Often the results are barely seen or unsatisfactory, especially in relation to hard total injuries (in cases of axononotmesis or neurotmesis), but this is not a reason to discontinue the rehabilitation. 2/3 from the parents replied to the question „Do you have financial means to provide your child with treatment?“ stating that they face serious financial difficulties in conducting the monthly rehabilitation treatment of smaller children, and for grown up children – difficulties in accompanying by the adult (sick-leave permission or paid leave). All parents point out the unsatisfactory work of the specialized state institutions expected to support the healing process of their children.

Conclusion

In order to achieve good result from rehabilitation of children, suffering from the birth trauma of the brachial plexus, early diagnostics and timely initiation of treatment, regular conduct of rehabilitation courses and making clear the severity of the problem to the parents, as well as their role in the treatment are of crucial importance.

The purpose of the complex physiotherapeutic and rehabilitation programme for children with birth trauma of the brachial plexus is to improve their self-service skills and to support the performance of various occupational and domestic activities as children grow up. Improvement of various hand grips, work with tools and utensils, inclusion of amusing and functional occupational therapy stimulate the performance of everyday life activities, promote the children’s independence, future professional orientation and realization.

Good results come hard and slow, but they significantly raise the options for better quality of life and professional realization of children with birth trauma of the brachial plexus.
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