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Case Report
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OBSTETRIC BRACHIAL PLEXUS PALSY AND REHABILITATION PROCESS: CASE PRESENTATION

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Abstract: Obstetric brachial plexus palsy (OBPP) is a clinical situation induced by the damage to the plexus brachialis and the branches originating from its location. While the diagnosis of OBPP can be made with a detailed examination performed right after the baby is born, it may limit the daily life activities of the child throughout his/her life when the situation noticed at a late stage. Treatment for OBPP can be grouped as conservative treatment, palliative surgery during conservative treatment, surgical therapy and late period treatment. In addition to all these, the physical therapy and rehabilitation processes are initiated for the patient from the moment the patient is diagnosed. The aim of the study is to reveal the importance of the early physiotherapy and rehabilitation program and the significance of the regular exercise program not neglected after a series of operations, in OBPP treatment. In this case presentation, we will present a 9-year treatment program, physiotherapy and rehabilitation period of a female patient with OBPP diagnosed at the time of birth, and her condition before and after this process.

Keywords: Brachial plexus, Obstetric brachial plexus palsy, Physiotherapy

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1. Introduction

Plexus brachialis is the neural network that consists of all anterior branches of the 5th-8th cervical and 1st thoracal spinal nerves and the anterior branches of the 4th cervical and 2nd thoracal nerves, and which spreads to the upper extremity (Arıncı and Elhan, 2006). The spinal nerves join and from the truncuses which also join and form the fasciculus (Arifoğlu, 2017). Among those which form the plexus brachialis, C5 and C6 form truncus superior, C8 and T1 form truncus inferior and C7 forms truncus medius (Özbağ, 2019).

Brachial plexus can be damaged as a result of pulling the arms above the head level in breech babies during labor. Strained and damaged spinal nerves may cause severe function loss by affecting the small muscles of the hand (Frade, 2019).

OBPP was defined by William Smellie, an obstetrician, for the first time in 1764. Later, French neurologist Guillaume Duchenne and German neurology professor Wilhelm Erb described the condition clinically known as Erb-Duchenne Paralysis in which C5-C6 root injuries and sometimes C7 injuries may accompany (Mollberg, 2018; Tandon and Tandon 2005). Approximately 10 years later, French neurologist Augusta Klumpke revealed the Klumpke Paralysis on which C8-T1 inferior root injuries and ophthalmological findings reported by Friedrich Horner can be seen together with the Horner Syndrome which is related to the involvement of sympathetic fibers (Suziki et al., 1984; Klumpke, 1885).

Although there are various reasons related to OBPP mechanisms, the most common reasons are direct or indirect compression or traction. Conditions such as compression neuropathy induced by asphyxia, oligohydramnios and intrauterine malposition can be regarded among the congenital factors (Yücetürk, 1994). Being a large baby of a diabetic mother or a breech baby are also important risk factors for OBPP (Kaplan and Başar, 2014).

Generally, OBPP has different incidences, and the incidence rate is reported as 5.1/1000 in developed countries (Uysal et al., 2007). The incidence rate in Turkey is reported as 0.9/1000 live birth (Yücetürk, 1994). Factors that may cause OBPP have been better understood in time. Despite increased cesarean births and developed technology, the fact that the incidence frequency of OBPP does not change is due to the babies' birth weights and mothers' metabolic diseases (Zafeiriou and Psychogiou, 2008; Alfonso 2011).

While the diagnosis of OBPP can be made with a detailed examination performed right after the baby is born, it may limit the daily life activities of the child throughout their life if noticed late (Van Der Sluıjs et al., 2004).

Although it is not difficult to make the diagnosis in the first place, it is necessary to benefit from the clinical observation and diagnostic procedures such as Moro reflex, tonic neck reflex and the condition of the extremity in a resting position within two weeks after birth (Gilbert, 1995). If the injured arm in the upper extremity is in total flexion and if no muscle activity is observed, then total involvement should be considered. The sensory is affected, and there is no reaction to a painful stimulus. There is also faintness and heat loss in the whole arm due to vasomotor involvement (Al Quattan et al., 2019). In patients with proximal involvement, arm is in internal rotation, elbow in semiflexion, fingers in flexion and there are no active movements (Cosmos, 2019).

Treatment for OBPP can be grouped as conservative treatment, palliative surgery during conservative treatment, surgical therapy and late period treatment (Cosmos, 2019). In addition to all these, the physical therapy and rehabilitation process is started for the patient from the moment the patient is diagnosed. If there is an OBPP condition noticed at the time of birth, then physiotherapy practices should be started after one week, if possible, and within three weeks at the latest. Shoulder abduction and elevation should not exceed 90° in the exercises made within the first three weeks. The patient should be evaluated every 2-4 weeks and the treatment program should be adjusted accordingly (Ramos, 200).

The primary goal of the treatment in the early period is to prevent contractures as well as to preserve the joint range of motion at the highest possible level (Kuran et al., 2007).

In this case presentation, we will show approximately 9 year-long treatment modalities and physical therapy and rehabilitation period of the female patient diagnosed with OBPP in birth and whose treatment process started very early and progressed for a long time in a multidisciplinary way, her condition before and after this process.

The aim of the study is to present the importance of the early physiotherapy and rehabilitation program and the significance of the regular exercise program, which was not neglected after a series of operations, in OBPP treatment. Additionally, we are in the opinion that early diagnosis and multidisciplinary work increased the success of the treatment and may prevent possible new complications that may appear.

2. Case Presentation

We will present the physical therapy and rehabilitation process of a female patient who was born with normal birth on 08.06.2008 and weighed 4750 grams and was diagnosed with left OBPP. The patient is the third child of a diabetic mother and has a difficult birth history. Follow-up was recommended after the examination during birth, and the family consulted to a physician after noticing immobility in the left arm of the baby when she was two months old, and physiotherapy was primarily started. Although minimal benefit was seen in the patient who received physiotherapy for five days a week within approximately eight months. She was brought to our center when she was two years old and her treatment still continues.

2.1. Physical Findings

According to MRI result of the patient, it has been reported that the left glenoid rim appears to be dysplastic and has a smaller glenoid cavity than normal.

As a result of the electromyography (EMG) taken on 09.07.2009, while there was a decrease in the compound muscle action potential (CMAP) and compound sensory action potential (CSAP) amplitudes in left n. ulnaris and n. medianus, mild chronic denervation in m. supraspinatus and moderate chronic denervation in m. biceps brachii were observed. The patient was reported to have degenerations compatible with the brachial plexus inferior truncus involvement and C8-T1 root avulsion.

When the patient started the physical treatment and rehabilitation program in our center, the arm was in flexion in the direction of internal rotation, the elbow was in a slight flexion position and the fingers were in the flexion position. The extremity was pale, sweaty, and there was sensory loss. There was minimal ptosis in the left eyelid. There were no active movements except minimal shoulder abduction and flexion (Figure 1).

Figure 1. Before treatment.

The patient underwent a shoulder tendon transfer operation in a university hospital for her left OBPP diagnosis on 02.04.2012. In this operation, m. latissimus dorsi and m. teres major tendons were transferred as external rotators. Shoulder myotomy (m. subscapularis myotomy), shoulder tenotomy (m. pectoralis major tenotomy) procedures were also performed in this operation. The patient received a plaster splint application for eight weeks and then, intense physical treatment application was started. There was a minimal increase in the shoulder, arm, hand and wrist movements of the patient at this stage, but there was a mild loss of strength and limitations.

2.2. Treatment Program

Our goal in this treatment is to eliminate limitations, ensure the mobility of joints, increase the joint range of motion, strengthen weak muscles, increase hand skills and ensure postural smoothness.

In this regard, electrotherapy practices took part in our treatment plan. Acupuncture TENS electrical stimulation was performed for 15 minutes in 1000 ms intervals with 50 ms current duration and in the form of a square current to ensure sufficient muscle contraction, and for 15 minutes in case of pain from time to time after the operation. Mostly superficial warmers (hot pack) among heat agents are preferred.

In the rehabilitation program, in the first periods before the surgical operation, massage therapy was applied to reduce edema and increase blood circulation together with passive exercises, and later interferential and diadynamic currents were applied.

Readjustments were made on the treatment plan after the surgical operation and the family was informed in every stage. While the electrotherapy practices continued, friction massage for the post-op scars and superficial massage applications also continued to increase the circulation. The exercise program included the Proprioceptive Neuromuscular Facilitation (PNF) (hold relax and repeated contractions) techniques, Codman exercises, mobilization techniques (scapular and glenohumeral), isometric exercises (for m. serratus anterior). Later on, when we reached the painless period, resistance exercises and progressive resistance exercises were included in the treatment program. Roller systems, TheraBand, springs, finger ladders and arm wheels were used. Kinesiological taping practices were applied when needed. The Southern California Sensory Integration Tests and sensory training bags with different structures were used for sensory training. Occupational therapies were also included. The joint range of motion of the patient increased after the study (Table 1).

Table 1. The patient's joint range of motion measurements

	After surgical treatment 2020	Before surgical treatment 2012	First pre-treatment evaluation 2010
Left shoulder			
Flexion:	70°	34°	15°
Extension:	5°	weak	0
Abduction	118°	55°	weak
Adduction:	20°	5°	0
Internal rotation	77°	weak	0
External rotation	70°	weak	0
Left elbow			
Flexion:	90°	24°	weak
Extension:	90°	27°	0
Pronation Supination	weak	0	0
Left wrist			
Flexion:	14°	3°	weak
Extension:	16°	7°	weak
Radial deviation:	weak	weak	0
Ulnar deviation:	weak	weak	0

The patient has started to be independent in daily life activities and is clinically better than before treatment (Figure 2). Considering the general evaluations, there is no serious improvement in fine motor movements in hands and fingers; thus, surgical and physical therapy applications will continue. Tendon transfer operations for the hand and wrist are in the planning stage.

2.3. Ethical Consideration

The study was conducted after obtaining the ethical committee approval of the İnönü University Health Sciences Non-Interventional Clinical Studies Ethics Committee with the decision number 2020/928. The family was informed about the content of the study and the Informed Consent Form was signed.

Figure 2. After treatment.

3. Results and Discussion

Babies with high birth weight and difficult birth history are at the risk of OBPP. While making the diagnosis in the early period increases treatment options and success, it is quite important to know the anatomical localization of the involvement (Benson et al., 1996).

While recovery is observed in some patients in the early postpartum period, some cases may have life-long permanent disabilities (Nehme and Kany, 2002).

Total plexus involvement, comorbid Horner syndrome, and severe sensory loss indicate a prognosis that will not go well (Leblebicioğlu, 2005). Our case also had a difficult birth history with high birth weight and her prognosis was bad due to total involvement.

Related studies have reported that the right-side extremity is affected more due to traction between the shoulder and neck since births usually take place from the left side, and the right shoulder enters the pelvis first and trips (McDaid et al., 2002). Unlikely, our case had a left-sided involvement.

Physical therapy and rehabilitation process is quite important in OBPP cases. The success rate is higher in cases who started the treatment early. A relevant study found that 53.12% of the patients had a full recovery after treatment and 25% had partial recovery after treatment. In this regard, 78.12% of the patients had partial or full recovery due to physical treatment and rehabilitation (Demir et al., 1999).

With the early onset of physical therapy and rehabilitation period and later directing the patient to surgery, the treatment of our case continued with a correct course. Physical therapy and rehabilitation program was applied to the patient before and after the surgery and was not interrupted. In line with our treatment goal, the joint range of motion was preserved and increased, the muscle strength was increased, flexibility was provided in soft tissues, in case of edema, edema was decreased, and the functionality of the patient was increased. At the same time, inaccurate use of extremity and deformity development were prevented.

It should be noted that especially multidisciplinary work is very useful to obtain such results in patients. We are in the opinion that an accurate physical therapy and rehabilitation program before and after the operation will accelerate the independence of not only the patients who have OBPP but all orthopedic and neurological cases in daily life activities.

Author Contributions

All authors have obtained the necessary data by evaluating our case in detail.

Conflict of Interest

The authors declared that there is no conflict of interest.

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