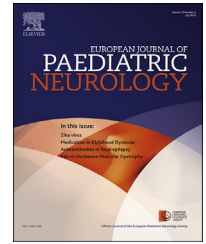




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Original article

Function in unaffected arms of children with obstetric brachial plexus palsy

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ABSTRACT

Objective: The objective is to compare the fine and gross motor function of unaffected arms of children with obstetric brachial plexus palsy (OBPP) with typically developing children's dominant upper extremities.

Methods: Fifty-three patients with OBPP and fifty-one typically developing children between the age of 4 and 13 were included in the study. For gross motor function evaluation in the upper extremity box-block test (BBT), for fine motor skill nine-hole peg (9HP) test was used. For grasp and pinch strength measurements, a Jamar dynamometer is used.

Results: The patient group performed significantly worse in 9HP and BBT tests. When further divided into age groups, 4–8 age patient group performed significantly worse in 9HP and BBT tests, while there were no differences in children in the 9–13 age group.

Conclusions: The fine and gross motor functions of the unaffected arms of children with OBPP are significantly worse in children between the ages of four and eight but this deficit improves with age, and possibly with ongoing therapy.

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1. Introduction

Obstetric brachial plexus palsy (OBPP) is the paralysis of the ipsilateral upper extremity after a brachial plexus injury that occurs during labor.^{1–3} It is seen in 0.4–5.1 in 1000 live births.^{2–4} It is usually unilateral, with a bilateral incidence of only 0.073/1000 live births. The clinical picture depends on the affected parts of the plexus. There is frequently upper trunk involvement that mainly results with muscle impairments in shoulder and elbow.⁵ Physical examination might reveal

muscle weakness and sensory deficits in the upper extremity and a difference in the length and width between upper extremities.^{2,3} There is a chance of spontaneous improvement. However, a considerable amount of the cases result in functional restriction and limitation in the activities of daily living even when there is mild clinical involvement.⁶

Treatment of OBPP aims to minimize the loss of motor and sensory function and maintain the range of motion (ROM) in the affected joints, therefore increasing the functional capacity. The evaluation and treatment process of a patient with

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OBPP requires a multidisciplinary approach and can require both conservative and surgical measures.

There are many studies that have focused on the involvement and treatment of the affected extremity in OBPP.⁴ It is known that patients with OBPP choose to use their unaffected hands more often⁷ but there is not enough data in the literature for the researchers to determine that these “unaffected” upper extremities can indeed function without any deficits. There is only one study that has evaluated the ROM of the unaffected arm in patients with OBPP with a three-dimensional movement analysis during the activities of daily living and compared it to typically developing children.⁵ But to the best of our knowledge, the fine and gross motor activities have not been yet compared to their healthy counterparts.

This study aims to compare the fine and gross motor function of unaffected arms of children with OBPP with typically developing children's dominant upper extremities.

2. Methods

2.1. Participants

Patients between the age of 4–13 with a diagnosis of unilateral upper trunk OBPP (C5, C6, ± C7) and age and sex-matched typically developing children were included in the study. Sixty-seven of the participants used their right hand while thirty-seven used their left hand. Exclusion criteria were the previous history of OBPP related surgery and any fracture, surgical intervention, botulinum toxin injection in the affected upper extremity in the past six months, the existence of visual and hearing problems, mental retardation and the use of affected extremity as the dominant extremity. The power of the study was pre-evaluated as 80% when 50 patients in each group are recruited. The study was approved by the ethical committee of Marmara University with the approval number of B.30.2.MAR.0.01.02/AEK/670. Parents of all the children who were included in the study have given their informed consent to participate in this study.

The unaffected upper extremities of children with OBPP and dominant extremities of typical children were evaluated. Dominant upper extremities in children were determined according to their preference while they eat or hold a pencil.⁸

2.2. Materials

Fine and gross motor skills and grasp and pinch strengths were evaluated in both groups.

For the evaluation of gross motor function in the upper extremity box-block test (BBT) is used. This test includes a 53.7 cm × 25.4 cm wooden box with two sections and 150 blocks that are 2.5 cm on each side. In this test, the subject needs to grasp the blocks and transfer them from one side to the other. The number of blocks removed in 60 s gives the score.⁹

For fine motor skill evaluation nine-hole peg (NHP) test is used. This test includes nine sticks that are 9 mm wide and 32 mm long and a standard wooden block with 9–10 mm radius holes placed 32 mm apart. The time for the subject to

place all the sticks in the holes is recorded.¹⁰ Both tests were repeated three times, the outliers of three tests were eliminated, and the mean values of the results were analyzed. Both tests were done by one hand only. Both tests were done in control group with the dominant hand to obtain optimal results.

Grasp strength was measured with a Jamar hand dynamometer, and pinch strength was measured with a Jamar pinch meter. Both of the measurements done while the child was sitting and shoulder in adduction and neutral, elbow in 90° flexion, forearm and wrist in neutral position. Both measurements were repeated three times, and the mean values of the results were analyzed.

2.3. Statistical analysis

Statistical analyses were done using the ‘SPSS 16.0’ software. Descriptive methods like mean, standard deviation and median were used to outline group characteristics. Comparison of the groups was performed with Student t-test and Mann Whitney U test. Correlation analysis was done using the Pearson correlation tests. The *p-value* <0.05 has been accepted as statistically significant.

3. Results

Fifty-three patients with OBPP and fifty-one typically developing children were included in the study. Thirty-two participants were between the ages of 4–8 in the patient group (60.4%) while twenty-one (39.6%) were between 9 and 13. In control group, there were thirty-two children (62.7%) between the ages of 4–8 while nineteen of them (37.3%) were between 9 and 13. There were twenty-eight boys (52.8%) and twenty-five girls (47.2%) in patient group while twenty-six boys (51.0%) and twenty-five girls (49.0%) participated in control group. There were no significant differences in age and sex between the patient group and the control group. In the patient group, eighteen patients (34%) had involvement in their right arm while thirty-five patients (66%) had involvement in their left arm. Two of the children in the control group (3.9%) used their left upper extremity as their dominant upper extremity.

The comparison of gross and fine motor function between patient group and control group is summarized in [Table 1](#). There were significant differences between groups in 9HP and BBT tests, while there were not significant differences between grasp and pinch strength (see [Table 2](#)).

The control and the patient group were also separately evaluated according to sex. The girls in the patient group performed significantly worse than the control group in BBT and 9HP tests, while there were no such differences between boys.

The patient and control group were further divided into two age groups: ages 4–8 and 9–13. These groups were also compared within each other according to sex. The female patients in 4–8 age group were significantly worse in BBT and 9HP tests, while there were no significant differences between grasp and pinch strength. Male patients in the same age group were significantly worse in 9HP and pinch

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