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Evaluation of Growth and Development in Male Patients with Cerebral Palsy and Normal People of 18 Years of Age

18 Yaşındaki Serebral Palsili ve Normal Erkeklerde Büyüme ve Gelişmenin Değerlendirilmesi

Rengin KOSİF[1], A. Tevfik SÜNTER[2]

[1] *Karaelmas University, Faculty of Medicine, Department of Anatomy*
[2] *Ondokuzmayıs University, Faculty of Medicine, Department of Public Health*

ÖZET: ***Amaç:*** Mental retardasyon, motor disfonksiyon, konuşma bozukluğu, zayıf koordinasyon, zayıf denge ya da anormal hareketler, öğrenme güçlüğü, dikkat bozuklukları, yutma güçlüğü, işitme bozukluğu, iletişim güçlüğü gibi nedenlerden dolayı, serebral palsili insanlar beslenme güçlükleri ile karşılaşabilmektedirler. Bu da büyüme ve gelişmeyi etkilemektedir. Bu çalışmada 18 yaş grubu sağlıklı genç erkeklerle, 18 yaş grubu serebral palsili genç erkeklerin bazı antropolojik ölçümleri karşılaştırılarak, serebral palsili gençlerin büyüme ve gelişmeleri değerlendirildi.

Gereç ve Yöntem: 18 yaş grubu sağlıklı genç erkekler ile 18 yaş grubu serebral palsili genç erkeklerin antropolojik ölçümleri ve deri kıvrım kalınlıkları alındı. Antropolojik ölçümler: boy, kilo, vücut kitle indexi, yaşa göre boy ve kilo için z skoru, baş çevresi, kol çevresi, biakromial genişlik, papilla mammae çapı, areola mammae çapı, orta hattan papilla mammae uzaklığı, oturma yüksekliği, kulaç uzunluğu, göğüs çevresi, thorax çıkışı çapı, thorax derinliği. Deri kıvrım kalınlıkları: Subscapular, triceps, suprailiak.

Çalışmamız 18 yaşında 46 sağlıklı genç erkek ve 16 serebral palsili genç erkek üzerinde yapılmıştır.. Zonguldak ilinde bulunan Spastik Çocuklar Merkezi ile Kozlu ilçesinde bulunan Sarı Başak Özel Eğitim Merkezi'ndeki serebral palsili gençlerden grubumuza uygun olanları seçilerek (GMFCS'a göre 1 ve 2) ölçümleri yapıldı. Sağlıklı gençler Karaelmas Üniversitesi merkez kampusü öğrencilerinden seçilmiştir.

Sonuç: Normal ve serebral palsili gençlerin ölçümleri karşılaştırıldığında baş çevresi, orta hattan papilla mammae uzaklığı ve oturma yüksekliği anlamlı olarak farklı bulundu. Ölçümler serebral palsili gençlerde daha küçüktü. Deri kıvrım kalınlıklarında fark bulunmadı.

Anahtar Kelimeler: serebral palsi, 18 yaş, antropolojik ölçümler, gelişme.

Correspondence: Rengin Kosif M.D. Karaelmas University, Faculty of Medicine, Department of Anatomy 67600, Kozlu, ZONGULDAK, TURKEY.
Tel: (0372) 2610243 Fax: (0372) 2610264
(E-mail: renginkosif@yahoo.com)

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ABSTRACT: ***Objective:*** The patients with cerebral palsy may encounter nutrition difficulties related to mental retardation, motor dysfunction, speaking difficulties, impaired coordination, impaired equilibrium and abnormal motions, learning difficulties, attention problems, troubles in swallowing and hearing, and communication problem. As a result of this situation, growth and development can be effected. In this study, the antropological measurements of healthy male indiviuals of 18 years of age and those of peer male patients with cerebral palsy were compared and the growth and development of the patients with cerebral palsy were evaluated.

Materials and Methods: The anthropological measurements of healthy male indiviuals of 18 years of age and peer male patients with cerebral palsy were performed and the skin fold thickness values were noted. The anthropological measurements were length, weight, head circumference, arm circumference, biacromial breadth, nipple diameter, the diameter of areola, the distance of the nipple from the median line, sitting height, fathom length, chest circumference, thoracic outlet diameter, thorax depth. The skin fold thicknesses used were subscapular, triceps, suprailiac.

The study was performed with 45 healthy young males of 18 years of age and 16 patients of the same age with cerebral palsy. The study group was selected among the young patients with cerebral palsy appropriate for the study (GMFCS 1 and 2) in Spastic Children Center in Zonguldak and Sari Basak Special Education Center in Kozlu and their measurements were done. The healthy controls were the students in the central campus of Zonguldak Karaelmas University.

Results: When the measurements of the normal individuals and those with cerebral palsy were compared, significant differences were found in head circumference, distance of nipple from the median line and sitting height.The measurements were smaller in the patients with cerebral palsy. No significant diffferences were found for skin fold thickness.

Key Words: cerebral palsy, 18 age, anthropologic measurements, growth.

INTRODUCTION

Cerebral palsy is a disorder mainly effecting the ability of movement and posture. It can be mild or severe depending on the localization and the amount of damage. It often accompanies other problems (1). The patients with cerebral palsy may encounter nutrition difficulties related to mental retardation, motor dysfunction, speaking difficulties, impaired coordination, impaired equilibrium and abnormal motions, learning difficulties, attention problems, troubles in swallowing and hearing, and communication problem and growth and development can be effected. Children with cerebral palsy are often limited in their activities because of primary and secondary impairments. A valid and reliable means of measuring functional limitations in children with cerebral palsy is now possible using the Gross Motor Function Classification System (GMFCS) for children up to 12 years old. The GMFCS enables clinicians to describe the severity of a child's functional limitations in one of five levels. Children in Level I are only mildly affected and can achieve most the activities of their age-matched healthy counterparts, with only modest qualitative differences. Conversely, children in Level V are the most limited in their activities and have little ability to control their head and trunk posture to counter the effects of the motor impairment and gravity. The patients at level I and II according to GMFCS classification are affected mildy from cerebral palsy and they are able to do the activities of their healthy peers; they can walk in the house and outside, they can sit at the chair, they can run and jump (2). It is reported in many studies in the literature that growth and development are retarded in children and juvenile individuals with cerebral palsy. Insufficient nutrition due to feeding difficulties is considered to be the main reason for this situation (3,4,5,6,). In this study we aimed to evaluate the growth and development of patients of 18 years of age with cerebral palsy by comparing them with their healthy peers. We intend to bring to light whether the young patients with cerebral palsy of 18 years of age, who completed their growth and development periods, are comparable with their healthy peers.

MATERIALS and METHODS

In this study, 18 years of age with cerebral palsy, level I and II according to GMFCS classification, were compared to peer healthy individuals. Forty six healthy young individual and 16 patients with cerebral palsy of 18 years of age were included in the study. The study group was selected among the young patients with cerebral palsy appropriate for the study (GMFCS Level I and II) in Spastic Children Center in Zonguldak and Sari Basak Special Education Center in Kozlu and their anthropological measurements were done. The study group of patients with cerebral palsy had no other systemic disease. The healthy individuals were among the students in Karaelmas University central campus. The anthropological measurements of healthy male individuals of 18 years of age and peer male patients with cerebral palsy were performed and the skinfold thickness values were noted. The anthropological measurements were length, weight, weight for age z-score (Wez), height for age z-score (Hez), head circumference, arm circumference, biacromial breadth, nipple diameter, the diameter of areola, the distance of the nipple from the median line, sitting height, fathom length, chest circumference, thoracic outlet diameter, thorax depth. The skinfold thicknesses used were subscapular, triceps and suprailiac.

0-39 mm Holtain skinfold caliper for skinfold measurements and 500mm/20 vernier caliper, for thorax depth measurements were used. Standard methods were used to evaluate the other measurements, respectively (1,7,8).

The length measurements were performed by tape measure on a fixed back ground. The same standard scales were used for all the weight measurements and the setting was checked before each measurement (1,9). The body mass index was obtained by dividing the weight to the square of the length (m) (1,10). The z scores for height and weight were calculated using the formula (measured value-mean value of the same age)/ standard deviation of the population (1,11). A line crossing the inion (protuberentia occipitalis externa) and glabella was measured for head circumference. For measuring the arm circumference, the arm was set free hanging down and the measurement was done from the middle of the right arm by tape measure. The biacromial breadth was determined by measuring the distance between right and left acromion points (12). The diameter of papilla mammae was measured by transparent plastic measure after obtaining its erectile state by palpation. The measurements were done for both sides and the smaller value was noted (13,14). The transverse diameter of the areola mammae was measured (15). The distance of papilla mammae to midline was determined by dividing the

distance between right and left papilla mammae centers measured by a standart measure at the end of the expirium, arms hanging laterally (16,17). The sitting height was determined by measuring the distance between the surface of the wooden, non-elastic chair on which the individual was sitting and the uppermost point of the head of the sitting individual (12). The fathom length was defined as the distance between the middle fingers of each hand when the person was in upright position and the arms were at an angle of 90° to the body (5). The chest circumference was found by measuring the horizontal line crossing papilla mammae when the respiration was in expirium phase and the thoracic outlet diameter was measured by the horizontal line crossing the ends of the tenth thoracal costae (12,18). For establishing the depth of thorax, the distance between the medline point of the sternum at the level of papilla mammae and back (10). The measurements were carried out by the same person. For skinfold thickness, the measurements were done from the midline of the triceps muscle in the arm, from the skin inferior to the scapula and from the skin in the suprailiac region. The measurements were done by the same person from the right side and were repeated for three times and the mean value was noted (1,11).

The statistical analysis of the measurements were done at the Ondokuzmayıs University, Department of Public Health using the SPSS 11,0 programme. Man Whitney U test was used to compare the two groups. A p value of <0.05 is used for significance.

RESULTS

The mean height, weight, body mass index (BMI), weight for age z-score (Wez), height for age z-score (Hez), head circumference, arm circumference, biacromial breadth, nipple diameter, the diameter of areola, the distance of the nipple from the median line, sitting height, fathom length, chest circumference, thoracic outlet diameter, thorax depth, the subscapular, triceps and suprailiac skinfold thicknesses of the 46 healthy males and 16 male patients (level I, II) with cerebral palsy are as Table I.

Table 1. *Characteristics of the study groups (Mean±SD)*

Measurements	**Healthy**	**Cerebral palsy**	**p**
Weight (kg)	68.69±8.35	65.56±14.22	>0.05
Length (cm)	174.28±7.61	168.63±11.92	>0.05
BMI	22.62±2.46	22.88±3.69	>0.05
Wez	0.24±0.82	-0.06±1.41	>0.05
Hez	0.12±1.20	-0.77±1.89	>0.05
Head circumference (cm)	57.37±3.32	54.81±3.64	<0.01
Arm circumference (cm)	28.53±3.02	26.15±4.30	>0.05
Biacromial breadth(cm)	41.62±4.66	40.60±3.71	>0.05
Thorax circumference (cm)	89.18±5.78	85.96±10.06	>0.05
Thoracic outlet (cm)	84.88±6.02	81.03±10.12	>0.05
Thorax depth (cm)	19.76±2.81	20.49±2.77	>0.05
The diameter of areola mammae (cm)	2.32±0.51	2.10±0.54	>0.05
The diameter of papilla mammae (cm)	0.46±0.14	0.47±0.11	>0.05
The distance of the papilla mammae from the median line (cm)	11.47±1.05	9.83±1.52	<0.01
Sitting height (cm)	90.44±7.08	84.65±6.09	<0.01
Fathom length (cm)	173.89±8.31	169.28±14.71	>0.05
Triceps skinfold (cm)	1.39±0.78	1.44±0.78	>0.05
Subscapular skinfold (cm)	1.72±0.71	1.88±1.11	>0.05
Suprailiac skinfold (cm)	2.23±0.79	2.88±1.60	>0.05

DISCUSSION

Growth retardation in the children with cerebral palsy has been well documented in the literature (1,3,19). Multiple aspects of skeletal growth and development are abnormal in children and adolescents with moderate and severe cerebral palsy (20). It has been reported that patients with cerebral palsy have growth failure when compared with age and sex-matched healthy children, and have different body compositions (3). Among patients attending a pediatric rehabilitation center, the mean z scores of height and weight were found to be as –1.7 ± 1.9 and –1.6 ± 1.8 respectively. The proportions of the children below the 2.5th centile for normal height and weight were 38%, and 42%, respectively in this study (19). Stallings et al reported lower Wez and Hez scores in children with spastic quadriplegic cerebral palsy in comparison to normals (4). Oztürk et al reported that there was significantly lower Hez score in children with cerebral palsy in 7-16 years old (1). Krick and Van Duyn found that children with cerebral palsy had significantly reduced weight and height than their age-and sex-matched counterparts without such impairment (20).

In this study, the mean weight of the patients with cerebral palsy was lower than the mean value for the young Turkish males of the same age (66.20±10.08kg) (21), while that of healthy young males in the study group was higher. However the difference was not statistically significant.

The mean height of the patients with cerebral palsy was also lower than the mean value for the young Turkish males of the same age (173.50±6.30cm) (21), while that of healthy young males in the study group was higher. However the difference was not statistically significant.

When the BMI was evaluated, it was observed that the measured values for both groups were comparable with the normal value of the same age and both groups were in 50 percentil (21). There was no significant difference between the Wez and Hez values of the two groups. Ünay et al found that children with cerebral palsy had reduced BMI, weight, height and skinfold thicknesses than their age-and sex-matched counterparts but revealed that the differences were not statistically significant (22).

The head circumference measurements revealed lower values for the patients with cerebral palsy than 56±2cm, which was the mean value for the Turkish young males (21), while the value was higher in the healthy group. The difference was statistically significant. Head circumference value of children with cerebral palsy were in between mean and -2 SD (21). Lower head circumference in the children with cerebral palsy has been documented in the literature and their percentil curve not equal age and sex matched counterparts (23,24).

Though the arm circumference values and the biacromial width were lower in the patients with cerebral palsy, the difference was not statistically significant. No value was reported before for the arm circumference and biacromial width of Turkish adults. Compared with the controls, Zainah et al found that children with cerebral palsy had significantly lower mean mid-arm circumference, weight and triceps skinfold thickness (25).

When the thoracic measurements were evaluated, it was found that thorax circumference and thoracic outlet circumference were higher in normal indivuals while thoracic depth was bigger in the patients with cerebral plasy. However the difference was not statistically significant. No value was reported before for the thoracic measurements of Turkish adults. Park et al found that children with level IV,V cerebral palsy had significantly reduced thoracic outlet than their age-and sex-matched counterparts (26).

While there were no statistically significant diferences between the groups in measurements of diameter of papilla mammae and diameters of areola mammae, the distance of papilla mammae from the midline was significantly lower in the patients with cerebral palsy.

The sitting height was found to be significantly lower in the patients with cerebral palsy than in normal individuals. The sitting height / height ratio was 50% in patients with cerebral palsy and 51% in the control group while it was reported before to be 52.7% in Turkish young population (21).Fathom length was found lower in the patients with cerebral palsy however the difference was not statistically significant. The fathom length/height ratio was 100% in patients with cerebral palsy and 99% in the control group while it was reported to be 103.2% in Turkish individuals of the same age (21).

There was no statistically significant difference between the groups with regard to the skinfold thickness though the triceps, subscapular and suprailiac skinfold thickness were higher in patients with cerebral palsy. The values were similar to that reported for Turkish individuals of the same age. Triceps and subscapular skinfold thicknesses were reported to be 1,6 cm for the Turkish individuals while no value was reported before for the suprailiac

skinfold thickness.21In the present study, suprailiac skinfold thickness was measured as 2.23±0.79 cm in the control group while it was 2.88±1.60 cm in patients with cerebral palsy.

The most considerable criterions for determination of the nutritional status are the BMI and the skinfold thickness (27,28). These values for the present study were comparable to those for the the normal individuals. For this reason, it is considered that the growth and development of the patients with level I and level II cerebral palsy were no altered significantly. It is reported in the literature that the lineer lengths of the bones in patients with cerebral palsy were lower than normal individuals (3,29). In the present study, the lengths and fathom lengths were not found to be significantly different. The only significant difference was in the sitting height. We conclude that the patients with level I and level II cerebral palsy can reach to lineer bone legths comparable to their healthy peers. However the significant differences between the groups in sitting height and distance of papilla mammae from midline are notable. Reduction in the bone density of the lumbal vertebrae has been reported for the patients with cerebral palsy (19). The difference in sitting height may be attributable to the reduction in the vertebral height. It is reported in the literature that when the children who have level I and II cerebral palsy according to GMFCS classification reach to the adult period, 8% show progression and 49 % remain in their previous level (30). As the patients with cerebral palsy in the present study had level I and II palsy according to GMFCS classification and had related minimal motor and postural disorders, it was considered taht they did not have trouble in nutrition. The subcutenous fat distribution was identical with their healthy peers. The head circumference, sitting height and distance of papilla mammae from the midline were smaller than their healthy peers. In corcordance with the literature, the patients with cerebral palsy could not reach to the normal head circumference diameters. They had lower sitting heights and papilla mammae closer to the midline than their healthy peers.

In conclusion the patients with level I and II cerebral palsy had body measurements comparable to their healthy peers except for the head circumference, sitting height and distance of the papilla mammae from the median line.

There have been a a lot of studies about children with cerebral palsy, investigation about young or adults with cerebral palsy has not been established yet. We have been thinking that our findings can be used as a reference study in the following grow up of the children who are being cerebral palsy, at the age of 18 and we will support to the studies in which couldn't be constituted in country standardization.

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