THE RELATIONSHIP BETWEEN ACTIVITIES OF DAILY LIVING, LESION SEVERITY AND PERCEPTUAL DEFICITS IN HEMIPLEGICS

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Abstract: The aim of this study was to investigate the relationship between sensory perception dysfunction and activities of daily living (ADL), and to investigate the relationship between sensory perception dysfunction and severity of lesion in hemiplegic patients. Also it was compared the sensory-perceptual-motor function in right and left hemiplegic patients.

45 stroke patients with ages ranged from 50-75 years were included the study. The Ayres Southern California Sensory Integration Tests (SCSIT) and Kertesz apraxia test were used to assess sensory-perceptual-motor problems. Barthel Index was used to assess ADL. Computerized tomography (CT) classification was performed to determine severity of lesion.

There was a significant correlation between Figure Ground (FG) and ADL (r: 0.42), Design Copying (DC) and ADL (r: 0.50), praxis and ADL (0.42) in left hemiplegics; FG and ADL (r: 0.40), DC and ADL (r: 0.49), apraxia and ADL (r: 0.39) in right hemiplegics. There was a significant correlation between ADL, sensory perceptual motor tests and CT results in all patients (r: 0.69) ($p<0.05$).When sensory-perception functions were compared between right and left hemiplegics; there was a significant difference in DC and FG test ($p<0.05$).

The results of this study showed the importance of a detailed evaluation of sensory-perception problems to increase the degree of independence in ADL in hemiplegics. Also, we concluded that CT scan findings are important in prediction of outcome of stroke patients. Detailed evaluation of sensory perception functions help to plan the treatment which could be change according to patient.

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HEMİPLEJİKLERDE LEZYON ŞİDDETİ, GÜNLÜK YAŞAM AKTİVİTELERİ VE ALGI BOZUKLUKLARI ARASINDAKİ İLİŞKİ

Özet: Bu çalışmanın amacı hemiplejik hastalarda lezyon şiddeti ve duyu algı bozukluğu ile duyu algı bozukluğu ve günlük yaşam aktiviteleri (GYA) arasındaki ilişkiyi incelemekti. Ayrıca sağ ve sol hemiplejik hastalarda duyu- algı- motor fonksiyonlar karşılaştırıldı.

Çalışmaya yaşları 50–75 arasında olan 45 hemiplejik hasta alındı. Ayres Güney Kaliforniya Duyu Bütünlüğü Testleri ve Kertesz apraksi testi duyu-algı-motor problemleri değerlendirmek için kullanıldı. Barthel İndeksi GYA'ni değerlendirmek için uygulandı. Bilgisayarlı tomografi sınıflandırması (BTS) lezyon şiddetini saptamak için yapıldı.

Sol hemiplejiklerde GYA ve şekil zemin algısı (ŞZA) (r:0.42), GYA ve desen kopya etme (DKE) (r:0.50) ile GYA ve praxis (r:0.42) arasında, sağ hemiplejiklerde GYA ve ŞZA (r:0.40), GYA ve DKE (r:0.49) ile GYA ve praxis (r:0.39) arasında anlamlı bir ilişki vardı. Tüm hastalarda lezyon şiddeti ile GYA ve duyu-algı-motor testler arasında anlamlı bir ilişki bulundu (r:0.69, $p<0.05$). Sağ ve sol hemiplejik hastalarda duyu-algı fonksiyonları karşılaştırıldığında DKE ve ŞZA da anlamlı bir fark vardı ($p<0.05$).

Bu çalışmanın sonuçları hemiplejik hastalarda GYA'de bağımsızlık derecesini artırmak için duyu algı problemlerinin detaylı değerlendirilmesi gerektiğini gösterdi. Ayrıca BT tarama bulgularının hemiplejik hastaların prognozunu tahmin etmede önemli olduğu görüldü. Duyu algı fonksiyonlarının detaylı değerlendirilmesi hastaya göre değişebilecek tedaviyi planlamaya yardım eder.

Anahtar kelimeler: Günlük yaşam aktiviteleri, hemipleji, duyu-algı-motor problemler

INTRODUCTION

Strokes remain a major source of functional disabilities in the elderly because of their frequency and consequences (1:520-523). Sensory-perceptual disturbances are among the most significant sequel of stroke patients. Perception can be viewed as a process of interacting with the external environment by means of a myriad of skills including motor skills, sensory integration, visual perception, cognition, and psychological and social components (2:151-182).Sensory-perceptual deficits may interfere with the

functional outcome in term of activities of daily living (ADL), social activities, and quality of life.(3:729-735,4:336-339,5:599-604,6:527-531).

Many studies confirm the impact of motor, cognitive, and perceptual sequel on functional autonomy. Among these sequel motor deficits are the most important in terms of their impact on the ability to carry out the ADL (7:1081-1086, 8:806-809, 9:493-496). Studies by Sea et al (10:355-360) and by Bechinger and Tallis (11:282-284) also report a significant relation between sensory deficits and performance of the ADL. Lincoln et al (12:231-234), Carter et al (13:449-454) and Tatemichi et al (14:202-207) reported a significant correlation between various components of the ADL and one or many particular cognitive components. Hajek et al (15:1331-1337) attributed the variance in performance on various functional evaluations to cognitive deficits. Some studies demonstrated that a relationship between perceptual deficits and performance of the ADL (16:551-559, 17:27-37, 18:410-418).

The location and size of the brain lesion are likely to play a part in functional outcome. Computerized tomography (CT) scans of head may be used to predict functional gain during the rehabilitation process and also to predict negative outcome when the lesions are bihemispheric (19:496-498). Kertesz and Ferro have demonstrated that lesion size correlated positively with the severity of apraxia in acute aned chronic stage in stroke patients (20:921-933).

The focus of previous studies was primarily on relation between ADL and cognition, with little emphasis on relation sensory-perception, lesion location and ADL.

The aim of this study was:

1) to investigate the relationship between sensory perception dysfunction measured by SCSIT and activities of daily living

2) to investigate the relationship between sensory perception dysfunction measured by SCSIT and severity of lesion according to CT classification

3) To compare the sensory-perceptual-motor function in right and left hemiplegic patients.

MATERIAL AND METHODS

Subjects

This study was performed at occupational therapy unit of Ankara Rehabilitation Center. 45 stroke patients (25 left and 20 right hemiplegics) were included to study. The duration since the onset of their strokes ranged from two to four months. The ages ranged from 50-75 years. The mean age of

right hemiplegics was 61.65 ± 2.77 years; left hemiplegics was 60.72 ± 2.18 years. Ten of right hemiplegics and ten of left hemiplegics were women. Informed consent was obtained from the patients before the study.

Instrumentation

1. The Ayres Southern California Sensory Integration Test (SCSIT) was used to assess sensory-perceptual motor problems (21). The following subtests were used:

a) The figure-ground perception test (FG): The book of test plates contains 16 test plates, each with three test items, making a total of six trial items and 48 test items. The test task requires that the patient select from the plate of six multiple-choice pictures the three that also are present in the upper stimulus picture. The patient responds by pointing to the response figure that corresponds to, and is like the stimulus figure. No verbal response is required. The patient's score is the total number of correct responses.

b) Design copying test (DC): Thirteen different shapes, a pencil and an eraser were used. The patient was asked to copy the same design as they were seen above. According to the evaluation system at the test book: 0–2 points were given to each figure, which was drawn, and total score, was calculated as sum of the each figure's points.

c) Localization of tactile stimuli (LTS): The examiner touches the patient's hand or forearm with pen while the patient's vision is occluded. The patient puts the tip of his or her index fingernail of the other hand on the spot touched by the examiner. The distance between the ink dot and the place indicated by the patient's finger, to the nearest tenth of centimeter is recorded.

d) Double Tactile Stimuli Perception (DTS): The examiner touches the patient's hand and /or posterior aspect of cheek with the eraser end of the pencil while the patient's vision is occluded. Stimuli are applied rapidly and one or two stimuli are given. When two stimuli are given, it is essential that these are given simultaneously. The total score is the sum of all points for the 16 test items on DTS.

e) Finger Identification (FI): This test requires the patient to point to the finger previously touched by the examiner while the patient's vision is occluded. The total score is the sum of all points for the 16 test items on finger identification.

2. Kertesz Apraxia Test: This test was used to assess apraxia. The test consists of 20 items in four descriptive categories. The items marked with an asterisk provide a test for object use (20:921-933).

Facial: 1. Put out your tongue. 2. Close your eyes 3. Whistle 4. Sniff a flower 5. Blow out a match

Intransitive (upper limb) 1. Make a fist 2. Salute 3. Wave goodbye 4. Scratch your head. 5. Snap your fingers.

Transitive (instrumental) 1. Use a comb 2. Use a toothbrush 3. Use a spoon to eat 4. Use a hammer 5. Use a key

Complex 1. Pretend to drive a car 2. Pretend to knock at the door 3. Pretend to fold a paper 4. Pretend to light a cigarette. 5. Pretend to play the piano

If good performance was achieved, the patient received a score of 3. Impaired, but recognizable performance was scored 2, and poor, only approximate performance scored 1. No performance, unrecognizable or unrelated gesturing, or erroneous use of objects was scored 0. Maximum score for all items was 60.

3. Chaudhuri CT classification was performed to determine severity of lesion by a neurologist (19:496-498). The CT classification was performed as follows:

Group 1. Normal CT

Group 2. Small superficial infarct. This was read as a small area, a cerebral lobe, such as a small left frontal lobe infarct, small left parietal lobe infarct.

Group 3. Large superficial infarct. Two or more lobes of one cerebral hemisphere infarct. (Example: frontal and partial lobe infarcts in the left cerebral hemisphere or frontal-parietal-temporal infarcts in right or left cerebral hemisphere).

Group 4. Deep infarct. This was read as infarct of the internal capsule or basal ganglia.

Group 5. Combination of deep infarct and large superficial infarcts. (Internal capsule or basal ganglia infarcts combined with frontal, and parietal and temporal or occipital infarcts of one cerebral hemisphere)

Group 6. Bihemispheric infarcts. These were infarcts in both cerebral hemispheres, either one in each cerebral hemisphere or more than one in each cerebral hemisphere. (Example: bitemporal infarcts, bioccipital infarcts, biparietal infarcts or temporal-parietal infarcts on right cerebral hemisphere and frontal infarct on left cerebral hemisphere, or occipital infarct on the right cerebral hemisphere and frontal parietal infarct on left cerebral hemisphere) The lesion severity was scored between 1 and 6 according to CT classification groups (for example group 2 was scored as 2) and after than these scores were correlated with other test results.

4. Barthel Index was used to assess activities of daily living (22:56-61).

Procedure

SCSIT tests were given to the patients individually in one session, and Barthel Index and Kertesz Praxis Test in a second session. However if a patient was tired, test was discontinued and additional session was scheduled later in the day.

Data analysis: The relationship between activities of daily living and sensory-perceptual deficits, severity of lesion were analyzed by the Spearmen's Correlation Co-efficient Test. Student t test was used to compare right and left hemiplegics.

RESULTS

According to CT classification, 8 (17.77 %) of the patients were in group II, 5 (11.11%) were in group III, 23 (51.12 %) were in group IV, and 9 (20.00 %) were in group V (Table 1).

Table 1. The results of CT classification

CT group	n	%
I	-	-
II	8	17.77
III	5	11.11
IV	23	51.12
V	9	20.00
VI	-	-
Total	45	100.00

There was a significant correlation between FG and ADL (r: 0.42, $p<0.05$), DC and ADL (r: 0.50, $p<0.05$), praxis and ADL (0.42, $p<0.05$) in left hemiplegics; FG and ADL (r: 0.40, $p<0.05$), DC and ADL (r: 0.49, $p<0.05$), praxis and ADL (r: 0.39, $p<0.05$) in right hemiplegics (Table 2).

Table 2. The relationship between ADL and sensory-perception-motor tests

ADL	Right n=20	Left n=25
DC	0.49*	0.50*
FG	0.40*	0.42*
LTS	0.23	0.27
DTS	0.30	0.31
FI	0.24	0.20
Praxis	0.39*	0.42*

Spearmen's correlation co-efficient *p<0.05

When the relationship between lesion severity and sensory-perception tests were examined; there was a significant correlation between CT and DC (r:0.42, p<0.05), CT and FG (r: 0.45,p<0.05), CT and LTS (r: 0.44, p<0.05), CT and FI (r:0.53, p<0.05), CT and praxis (r: 0.50, p<0.05) There was a significant correlation between ADL and CT results in all patients (r:0.69, p<0.05) (Table 3).

Table 3. The relationship between the CT results, ADL and sensory-perception-motor tests

SCSIT (n= 45)	CT result
DC	r:0.42*
FG	r:0.45*
LTS	r:0.44*
DTS	r:0.45
FI	r:0.53*
Praxis	r:0.50*
Barthel	r:0.69*

Spearmen's correlation co-efficient *p<0.05

When sensory-perception functions were compared between right and left hemiplegics; there was a significant difference in DC and FG test (p<0.05). There was no significant difference in LTS, DTS, FI, Kertesz praxis test and ADL test between right and left hemiplegics.

DISCUSSION

The aim of this study was to investigate the relationship between sensory-perception dysfunction, severity of lesion and ADL. Also it was compared the sensory-perceptual function in right and left stroke patients. In our study we found significant correlations between FG, DC, praxis and ADL.The relationship between ADL and sensory-perceptual performance have been demonstrated in previous studies (12:231-234, 13:449-454, 16:551-559, 23: 986-988). Titus et al. investigated the relationship between ADL and perception performance. They found that sensory perception problems affect ADL (18:410-418). Bernspang et al. examined the effectiveness of motor and perception deficits on self care ability (7:1081-1086). Ishikawa et al demonstrated that age, sex, motivation and perception effect ADL in hemiplegics (24:354-363). The results of our study are similar to the results of previous studies. The sensory-perception problems affect degree of independence in activities of daily living in both right and left hemiplegics.

Previous studies demonstrated that the lesion localization and lesion severity according to the CT results effected functionality and ADL in hemiplegics (25:174-176, 26:107-112). Mukherje et al. demonstrated that CT scan findings are important in prediction of outcome of stroke patients (25:174-176). In our study, there was a significant correlation between the results of CT and ADL ($p<0.05$). Chaudhuri et al. investigated the correlation between CT results and functional status. They reported admission CT scans were associated with return to independent functioning (19:496-498). Kertesz and Ferro indicated that the severity of apraxia and lesion size was positively correlated (20:921-933). The results of our study were similar with the results of previous studies. It was found that as lesion severity increased the independence level of activities of daily living of patients decreased.

To the best of our knowledge, there wasn't any article which correlated CT results and sensory-perceptual tests. In our study, it was found a significant correlation existed between CT results and the results of sensory perception tests. It can be thought that as a result of increasing of lesion severity; sensory-perception deficits could be increase in hemiplegics.

The hemiplegic patients have different sensory perception problems. Previous studies that compare the sensory-perception problems of left and right hemiplegic patients have varying results (27:517-521, 28:79-83, 29:292-294, 30:333-335, 31:79-85). Some studies have determined that left hemiplegic patients have much more visual motor perception contrary to this some other studies indicated that right hemiplegic patients have much more sensory perception problems. In our study, when the functions of sensory-perception compared in right and left hemiplegics, left hemiplegics were more successful in FG, DC which are part of visual perception tests ($p<0.05$). There was no any significant difference in other tests between right and left hemiplegic patients ($p>0.05$). Revealed conflicting results of studies have been thought that visual perception deficits could be appear in both hemispheres and different parameters could affect the result. On the other hand, LTS, DTS and FI tests results were not significantly different between right and left hemiplegic patients.

The present study is just a preliminary examination in Turkey and interpretation of the results is limited by the small sample sizes. It was performed within a population admitted to a rehabilitation hospital and in need of rehabilitation.

CONCLUSION

The results of this study showed the importance of a detailed evaluation of sensory-perception problems to increase the degree of independence in ADL

in hemiplegics. Also, we concluded that CT scan findings are important for the prediction of outcome of stroke patients. Detailed evaluation of sensory perception functions may help to plan the treatment which could be change according to patient.

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