The Effect of Unilateral Visual Neglect on Mobility Status and Quality of Life in Stroke Patients

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Abstract

Aim: Unilateral Visual Neglect (UVN) in stroke patients refers not to respond or orient to a visual stimuli appearing on the side contralateral to the lesion. The purpose of this study was to explore the effect of the UVN on disability status and quality of life in stroke patients.

Methods: This study was undertaken in the outpatient of the neurological clinic. There were 34 ischemic stroke patients (mean age 60.5 ± 10.6 years) in the study. Nineteen of this patients were diagnosed with UVN by using the Line Bisection Test, Letter Cancellation Test and Catherine Bergego Scale. Information was collected on disability status [Barthel Index (BI) and the Rivermead Mobility Index (RMI)] and the Health-Related Quality of Life (HRQOL) [(SF-36)].

Results: It was determined that the BI and RMI scores in UVN patients were lower than the non-UVN patients (p<0.01). In patients with UVN, the SF-36 subgroups physical functioning (PF), general health, vitality, and emotional role (ER) were negatively influenced and the difference was statistically significant compared with those patients without UVN (p<0.05). There was a strong correlation between the BI and the general health perception at last year and a statistically significant correlation between the RMI and physical role (PR) in the UVN group (p<0.05).

Conclusion: It was found that the disability status was poorer in the stroke patients with UVN which has effected many subgroups of HRQOL negatively. As a consequence, it is required to develop appropriate treatment modalities for this complex, multifactorial syndrome in further studies.

Keywords: Unilateral visual neglect, stroke, disability status, quality of life

Strok Hastalarında Tek Taraflı Görsel İhmalin Disabilite Düzeyi ve Yaşam Kalitesine Etkisi

Özet

Amaç: Tek taraflı görsel ihmal (TGI), inme hastalarında lezyonun kontralateraline uygulanan anlamli bir görsel uyaran cevap verememe, bu bölgeye oryante olamama olarak kendini gösterir. Bu çalışmanın amacı, inme hastalarında TGI’nin disabilite düzeyine ve yaşam kalitesine etkisini incelmektedir.

Yöntem: Bu çalışma, nöroloji polikliniğinde takip edilen ve yaş ortalamaları 60.5 ± 10.6 yıl olan, toplam 34 iskemik inme hastası ile yapıldı. On dokuz hasta, Line Bisection Test, Letter Cancellation Test ve Catherine Bergego Scale kullanılan TGI tanıtıldı. Hastaların disabilite düzeyleri Barthel İndeksi (BI) ve Rivermead Mobilite İndeksi (RMI) ile, yaşam kaliteleri SF-36 ile kaydedildi.

Bulgular: TGI’li hastaların, BI ve RMI skorlarının TGI’i olmayanlara göre daha düşük olduğu ve aradaki farkın istatistiksel olarak anlamli olduğu belirlendi (p<0.01). SF-36’nın fizikal fonksiyon (FF), genel sağlık (GS), vitalite (V) ve emosyonel rol (ER) parametrelerinin TGI grubunda olumsuz yönde etkilediği, kontrol grubuyla karşılaştırıldığında aradaki farkın istatistiksel olarak anlamli olduğu bulundu (p<0.05). TGI grubunda, BI ile yaşam kalitesinin sadece önceki yıla göre genel sağlık algısı arasında güçlü bir korelasyon belirlendi (p<0.05). RMI ile sadece fiziksel rol arasında çok güçlü bir korelasyon vardı (p<0.01).

Sonuç: Bu çalışmanın sonucunda, disabilite düzeyinin TGI’li inme hastalarında daha düşük olduğu ve bu durumun yaşam kalitesinin pek çok parametresini olumsuz yönde etkilediği bulundu. Sonuç olarak, gelecekteki çalışmalarla bu kompleks, multifactöryel sendrom için uygun tedavi modalitelerinin geliştirilmesi gerekmektedir.

Anahtar Kelimeler: Tek taraflı görsel ihmal, inme, disabilite düzeyi, yaşam kalitesi
INTRODUCTION

Unilateral Visual Neglect (UVN) is a common deficit in patients who have had a right-hemisphere stroke. It can disrupt many aspects of daily living and neglect has repeatedly been found to be among the strongest predictors of poor functional recovery in stroke patients. UVN in stroke patients refers not being responsive to or able to orient to a visual stimuli appearing on the side contralateral to the lesion. Cerebral infarct is the most common cause of UVN (2).

UVN appears after the lesions including parietal cortex, frontal lobe, cingulat gyrus, striatum, thalamus or specific brain stem nuclei. These areas produce the neural network which is responsible from the visuo-spatial attention. Hemineglect is more severe and longer lasting following right-sided as opposed to left-sided brain damage. This has led to the right hemisphere being attributed with playing the primary role in spatial processing (5,6,9,10).

Owing to the different treatment procedures, assessment time and case selection, the UVN frequency is variable. Not clearly documented in the literature, the UVN incidence after right hemisphere damage is found to be between 13-85 % (10,11,12,16,17,18,19).

The presence of UVN may adversely affect functional recovery. In addition, it is associated with rehabilitation taking longer and being less complete than in patients without UVN (1,4,10,21,22,23). Patients with UVN are faced with a long term rehabilitation process to regain a normal or near to normal life as they had previously.

Traditionally, in stroke patients, epidemiological studies focused on mortality and recurrence and not on the issue of quality of life (QOL). Recently, it has been suggested that assessments of neurological function and disability are insufficient to evaluate the total influence of a stroke on the well being of a patient. QOL related to strokes and life satisfaction after a stroke are important healthcare issues that have not received sufficient attention in the literature to date. Therefore, QOL has been put forward as an important index of outcome after a stroke as it is likely to be more relevant to the patient than impairment or disability (21).

This study aims to investigate the effect of the UVN on disability status and QOL in stroke patients.

METHODS

Subjects

The study was carried out on 34 ischemic stroke patients diagnosed on the basis of The World Health Organization’s definition of stroke and brain computed tomography scan or magnetic resonance imaging. The mean age was 60.5 ± 10.6 (32-79) years. The UVN group consisted of 19 patients and the control group consisted of 15 patients. The lesion sites of the patients were frontal (n= 7); parietal (n=22); parietotemporal (n=4) and frontotemporal (n=1).

Patients were admitted onto the study if they satisfied the following criteria: (1) right-handed (according to the Edinburgh Handedness Inventory) (2) subacute-chronic state right ischemic stroke patients (3) literate and achieving 23 or more on the Mini Mental State Examination (MMSE) (4) sufficiently healthy to participate in the evaluation (5) living with their family (6) joining the study voluntarily.

Exclusion criteria were as follows (1) transient ischemic attack or subarachnoid hemorrhage (2) posterior cerebral artery and basal ganglia infarct or hemorrhage (3) homonymous hemianopsia (4) perception or cooperation problem and history of neuropsychiatric disorder (5) depression (according to the Hamilton Depression Scale).
Approval was obtained from the University of Dokuz Eylul, Human Ethics Committee before commencing this study. Written consent was received from all subjects (approval number 05/01/04, date 8 Jan 2004).

**Measurements**

Data were collected including patient demographic characteristics. UVN was diagnosed by a neurologist and physical therapist using the Line Bisection Test, Letter Cancellation Test, Catherine Bergego Scale \(^{(1,4,5,9,11,28)}\). All patients were given 2 paper and pencil tests that were previously found highly sensitive to neglect (1) the Line Bisection Test consisted of 20 horizontal black lines of three different line lengths on an A4 sheet. The patient was asked to mark the centre of each line. Scoring involves the number of omitted lines as well as the deviations from the true midpoint; (2) the Letter Cancellation Test is a set of four cancellation tests, two of that involve letters (verbal stimuli), other two symbols (non-verbal stimuli). A structured and a randomised array are presented to the subjects and asked to circle the letter A and Ø on an A4 horizontal piece of paper using for every 10 items different coloured pencils. The score is the total number of omissions. The healthy adults less than 50 years could complete each of the four tests without error in less than two minutes, older than 50 years old not more than one error per array 3) the Catherine Bergego Scale (CBS) was performed at the same day with paper-pencil tests. The CBS was scored by the physical therapist’s observation of the patient. The CBS includes 10 common everyday life items. For each item, a 4-point scale was used, ranging from 0 (no neglect) to 3 (severe neglect). A total score was calculated (range, 0–30). As a consequence, 19 subjects showed left hemispatial neglect during pencil and-paper activities and the CBS.

The motor function part of the National Institute of Health Stroke Scale (NIHSS) was used to establish the stroke severity on motor functions. Hemiparesis severity was calculated in the upper and lower limbs separately (0=normal, 4=severe hemiparesis). These scores were summarized and patients were classified according to the hemiparesis severity between 0 to 8 points (0=no motor defect, 1-2=mild hemiparesis, 3-5=moderate hemiparesis, 6-8=severe hemiparesis) \(^{(7)}\).

Disability status on ADL was evaluated with the Barthel Index (BI), which gives a score ranging from 0 to 100 (100= physical independence, 75-95= mild disability, 50-70= moderate disability, 25-45= severe disability, 0-20= very severe disability). The top score implies full functional independence, but not necessarily normal status. BI comprises 10 items measuring feeding, bathing, grooming, dressing, bowel control, bladder control, toileting, chair/bed transfer, ambulation and stair climbing. Original BI scoring vary between the ranges of 0-5, 1-10 and 0-15 points to this titles. The BI score is highly correlated with independent functional ability and and the ability to return home. Additionally, the BI score before the start of rehabilitation gives an indication as to the expected rate / duration of the patient’s recovery \(^{(18)}\).

Mobility status was measured by the Rivermead Mobility Index (RMI), a simple scale that assesses disability status in mobility through questions about 14 activities and direct observation of 1. These activities range from turning over in bed, standing unsupported, walking inside and outside (with and without an aid), going up stairs and picking up something from the floor to running. Scale scoring ranges from 0 to 15, with 0 indicating complete inability. Mobility disorder is classified into groups as follows: 0-6 points = severe, 7-11= moderate, 12-15= mild \(^{(6,9,19,26)}\).
Health-related quality of life (HRQOL) was assessed by means of The Medical Outcomes Study Short-Form Health Survey Scale-36 (SF-36) which is a generic, subjective, valid measure for the assessment of HRQOL after a stroke \cite{3,8,12,13,15,20}. It facilitates assessment across 8 health domains: physical functioning (PF), role limitations due to physical problems-physical role (PR), bodily pain (BP), general health (GH), vitality (V), social functioning (SF), role limitations due to emotional problems-emotional role (ER) and mental health (MH). Scores were assessed for these 8 domains and general health perception of last year. Each health domain was scored from 0 to 100.

**Statistical Analysis**

The statistical package SPSS, Version 11, was used to analyze the results. All data is expressed as mean ± standard deviation (SD) and a 2-tailed probability value of p less than .05 was the criteria for statistical significance.

Mann-Whitney U Test were used to compare means of demographic characteristics, disability status (in ADLs and mobility) and HRQOL of both groups. The relationships in disability index scores (BI and RMI) and HRQOL (SF-36) score between UVN and control groups were examined using Spearman Correlation Analysis.

**RESULTS**

Thirty-four patients were included in the study. The sample comprised 19 UVN and 15 control patients. The means and standard deviations of age, body weight, body length and BMI in the UVN group and control group are summarised in Table 1. There was not a statistically significant difference between the groups in demographic variables (p>.05).

### Table 1: The Comparison of Demographic Data of UVN and Control Group Patients

<table>
<thead>
<tr>
<th></th>
<th>UVN Group X ± SD (min-max)</th>
<th>Control Group X ± SD (min - max)</th>
<th>Mann-Whitney U p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td>57.84 ± 7.12 (46-70)</td>
<td>63.86 ± 13.35 (32-79)</td>
<td>.051</td>
</tr>
<tr>
<td>Body weight (kg)</td>
<td>68.21 ±11.29 (50-90)</td>
<td>73.26 ± 11.81 (45-87)</td>
<td>.164</td>
</tr>
<tr>
<td>Length (cm)</td>
<td>167.15 ± 9.02 (150-182)</td>
<td>168.2 ± 9.79 (150-184)</td>
<td>.728</td>
</tr>
<tr>
<td>BMI (kg/ m²)</td>
<td>24.41 ± 3.81 (17.3-31.51)</td>
<td>25.81 ± 2.7 (20-29.94)</td>
<td>.218</td>
</tr>
</tbody>
</table>

It was found that BI and RMI scores of the UVN group were lower (BI: 82.63 ± 12.67; RMI: 9.15 ± 3.25) compared with the control group patients’ scores (BI: 98.33 ± 3.08; RMI: 13.13 ± 1.30). There was statistically significant difference between BI and RMI scores of the UVN group and control group (p<.05) (Table 2).

According to NIHS Scale, the UVN group patients (moderate to severe hemiparesia) scores are higher than the control group patients (no motor defect to mild hemiparesia) which means severe motor disability for UVN patients (Table 3).
Table 2: Comparison of BI and RMI Scores in UVN and Control Group Patients

<table>
<thead>
<tr>
<th></th>
<th>UVN Group</th>
<th>Control Group</th>
<th>Mann-Whitney U p</th>
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<tbody>
<tr>
<td></td>
<td>X ± SD</td>
<td>X ± SD</td>
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<tr>
<td>(min-max)</td>
<td>(min-max)</td>
<td>(min-max)</td>
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<tr>
<td>BI score</td>
<td>82.63 ± 12.67 (55-100)</td>
<td>98.33 ± 3.08 (90-100)</td>
<td>.0001*</td>
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<tr>
<td>(0-100)</td>
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<tr>
<td>RMI score</td>
<td>9.15 ± 3.25 (1-14)</td>
<td>13.13 ± 1.30 (12-15)</td>
<td>.0001*</td>
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<td>(0-15)</td>
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Table 3: NIHSS Scores of UVN and Control Group Patients

<table>
<thead>
<tr>
<th></th>
<th>UVN Group</th>
<th>Control Group</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td></td>
<td>n= 19</td>
<td>n=15</td>
<td>n=34</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>%</td>
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<td>NIHSS (skor)</td>
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</tr>
<tr>
<td>0</td>
<td>- -</td>
<td>8 53.3</td>
<td>8 23.5</td>
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<tr>
<td>1-2</td>
<td>- -</td>
<td>7 46.7</td>
<td>7 20.6</td>
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<tr>
<td>3-5</td>
<td>11 57.9</td>
<td>- -</td>
<td>11 32.4</td>
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<tr>
<td>6-8</td>
<td>8 42.1</td>
<td>- -</td>
<td>8 23.5</td>
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<tr>
<td>TOTAL</td>
<td>19 100.0</td>
<td>15 100.0</td>
<td>34 100.0</td>
</tr>
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</table>

It was observed that in patients with UVN, all subgroups scores of the SF-36 Scale were higher than the SF-36 scores of the control group. However, when the SF-36 scores of the UVN group were compared with the control group, there was a significant difference in PF, GH, V, and ER (p<.05) (Figure 1).

The stroke patients with and without neglect were then correlated with regard to their disability scores (BI and RMI) and QOL scores (SF-36). In the UVN group, based on Pearson correlation coefficient analysis for BI and SF-36 subgroups, a strong-positive correlation was indicated only between BI and the general health perception of last year (question 2) (rho=+.541, p<.05). There was a weak correlation between BI and the other SF-36 subgroups (PR, V, ER) (p>.05). In addition, it was found that the correlation between RMI and all subgroups of SF-36 was weak (p>.05) (Table 4).

Figure 1: The comparison of SF-36 sub groups and Question 2 in UVN and control group patients
In the control group (excluding the UVN group), a strong correlation was found between BI and PF (rho=+.634, p<.05), SF (rho=+.617, p<.05). It was found that there was a positive and very strong correlation between RMI and PR (rho=+.749, p<.01), PF (rho=+.749, p<.01). Additionally, the correlation of RMI and SF (rho=+.591, p<.05), ER (rho=+.559, p<.05), MH (rho=+.532, p<.05) were positively strong. In the same group, a weak correlation between BI and SF-36 subgroups PR, BP, GH, V, MH and general health perception of last year (question 2) was observed (p>0.05) (Table 4).

**Table 4**: The Correlation Between BI and RMI with SF-36 subgroups and Question 2 in UVN and Control Group Patients

<table>
<thead>
<tr>
<th></th>
<th>PF</th>
<th>PR</th>
<th>BP</th>
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<td>BI</td>
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<tr>
<td>UVN</td>
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<tr>
<td></td>
<td>0.387</td>
<td>-0.21</td>
<td>0.267</td>
<td>0.193</td>
<td>-0.04</td>
<td>-0.404</td>
<td>-0.06</td>
<td>0.132</td>
<td>0.541</td>
</tr>
<tr>
<td>P</td>
<td>0.102</td>
<td>0.388</td>
<td>0.269</td>
<td>0.429</td>
<td>0.871</td>
<td>0.087</td>
<td>0.807</td>
<td>0.590</td>
<td>0.017**</td>
</tr>
<tr>
<td>GROUP</td>
<td>rho</td>
<td></td>
<td></td>
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<td>RMI</td>
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<tr>
<td>P</td>
<td>0.59</td>
<td>0.813</td>
<td>0.132</td>
<td>0.858</td>
<td>0.731</td>
<td>0.250</td>
<td>0.574</td>
<td>0.874</td>
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<td>BI</td>
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<td></td>
<td>0.634</td>
<td>0.286</td>
<td>0.170</td>
<td>0.389</td>
<td>0.443</td>
<td>0.617</td>
<td>0.132</td>
<td>0.48</td>
<td>0.155</td>
</tr>
<tr>
<td>P</td>
<td>0.011**</td>
<td>0.302</td>
<td>0.545</td>
<td>0.152</td>
<td>0.098</td>
<td>0.014**</td>
<td>0.64</td>
<td>0.07</td>
<td>0.582</td>
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<tr>
<td>GROUP</td>
<td>rho</td>
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<td>RMI</td>
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<td></td>
<td></td>
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<tr>
<td>P</td>
<td>0.001*</td>
<td>0.007*</td>
<td>0.562</td>
<td>0.055</td>
<td>0.067</td>
<td>0.02**</td>
<td>0.03**</td>
<td>0.041**</td>
<td>0.252</td>
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</tbody>
</table>

**DISCUSSION**

Improving the QOL of stroke patients has received increasing attention in the development of therapeutic strategies. In many studies, unilateral spatial neglect has consistently been identified as a negative predictor for a patient’s recovery of independence in daily living. However, the focus of these studies was primarily on ADLs and the motor aspects of recovery with little emphasis on the effect of disability on QOL in neglected stroke patients (24,25,27,28).

We aimed to investigate the effect of UVN on disability status in stroke patients. It was found that the disability status of the UVN group patients was higher than the control group patients. Similarly, the QOL level of the control group was higher than the QOL level of the UVN group.

UVN represents an alteration in the construction of the bodily and/or the nonbodily space in non-dominant right hemisphere located lesions. As the left side of the body is often underused in patients...
with left neglect, it is not surprising that spatial neglect has been found to be among the most important factors influencing postural ability in hemiplegic patients (3). In addition to these results of the syndrome, automatically diminished visual field, hypokinesia and fear of falling result in a decrease in mobility and are other co-factors enhancing the disability status in ADLs. Of all of the stroke patients in this study, only those in the UVN group had severe motor involvement. Therefore, disability status in ADLs and mobility activities may have been influenced by aspects of the syndrome.

It was found that neglect patients showed poorer outcomes in the four subgroups of QOL (physical function, general health, vitality and emotional role) when compared with non UVN patients. It is thought that these outcomes may be influenced by a decrease in the activity level and difficulties in ADLs and mobility which may originate from a tendency to social isolation.

Additionally, in the UVN group, the dependency level in ADLs, according to the Barthel Index, was associated only with the general health perception of the last year score of SF-36. This finding is different from the control group’s HRQOL scores. In the control group, there was a strong correlation between BI and physical function, social function, emotional role and mental health subgroups of SF-36. Additionally, it was observed that there was a strong correlation between RMI and one subgroup of SF-36 (FR) in both groups.

However, this correlation level was different in the UVN group and control group. While UVN group patients have lower BI and RMI scores, there is not a correlation between all subgroups of SF-36.

A strong correlation between disability level and QOL in UVN patients was expected. However, in the control group, a negative influence of the disability status in many aspects of QOL was observed, the same result was not seen in all subgroups of QOL in the UVN group patients. This may originate from the fact that the UVN patients may neglect the lasting problems of their syndrome as they have a tendency to neglect the visual field. They do not realise the main results or are carelessness about the effects in ADLs or mobility problems. They can define their disability problems but they can not find a connection with QOL.

QOL was affected in stroke patients with UVN negatively because of the poor disability status. However, this negative influence was not seen in all subgroups of QOL.

As a consequence, in further studies, there may be a requirement to develop for this complex, multifactorial syndrome appropriate treatment modalities.

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