Journal of Neurological Sciences [Turkish] **28:(1)**# 26; 004-013, 2011
http://www.jns.dergisi.org/text.php3?id=406
Research Article

Adaptation to Turkish Community and Reliability-Validity of ADCS-ADL Scale

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Summary

Objectives: The aim of the present study is to assess the validity and reliability of Turkish adaptation of the Alzheimer Disease Cooperative Study-Activities of Daily Living (ADCS-ADL) scale and to enable the use of this scale in Turkey in Alzheimer Disease(AD) related studies.
Material and Method: Thirty-two patients with AD, 10 suspicious demented patients (mild cognitive impairment) and 31 non-demented control subjects with similar age, gender and educational status were enrolled to the study. ADCS-ADL, Modified Older Americans Resources and Services Procedures Instrument(MOARSI), Mini Mental State Examination(MMSE), Clinical Dementia Rating (CDR) and Global Deterioration Scale(GDS) were applied to all subjects. Alzheimer Disease Assessment Scale-Cognitive Scale(ADAS-Cog) was also applied to the demented and suspicious demented subjects. Internal consistency, test-retest reliability, differential validity and concurrent validity were statistically analyzed.
Findings: ADCS-ADL differentiated AD group from normal and suspicious demented groups significantly (p: 0.0001). Additionally, the scale was found sensitive to dementia stages (p: 0.01). A significant correlation between the ADCS-ADL scores of AD group and MMSE(r:0.736), CDR (r:0.758), CDR Total (r:0.828), GDS (r:0.743), basic section of MOARSI (r:0.826) and instrumental section of MOARSI (r:0.826) groups were detected. The correlation with ADAS-Cog was weak (r:0.191). Internal consistency values were measured as α: 0.937, 0.719 and 0.758 for AH, suspicious demented and control groups respectively. Test-retest reliability was quite high (ICC: 0.998).
Conclusion: The study showed that Turkish adaptation of ADCS-ADL is valid and reliable scale in assessing and monitoring the AD patients in Turkish society.

Key words: Alzheimer disease, activities of daily living, ADCS-ADL, reliability-validity

ADCS-ADL Ölçeğinin Türk Toplumuna Uyarlanmasi ve Geçerlilik-Güvenilirliği

Özet

Amaç: Bu çalışmada, Alzheimer hastalarının günlük yaşam aktivitelerini değerlendiren Alzheimer's Disease Cooperative Study-Activities of Daily Living (ADCS-ADL) ölçeğinin, Türkçeye uyarlanarak, toplumumuzda geçerlilik ve güvenilirliğinin araştırılması ve ülkemizde Alzheimer hastalığı (AH) ile ilgili çalışmalarda kullanılabilmesi amaçlanmıştır.
Yöntem: Çalışmaya, 32 Alzheimer, 10 kuşkulu demans (hafif kognitif bozukluk) hastası ve benzer yaş, eğitim düzeyi ve cinsiyet dağılımına sahip demansı olmayan 31 kontrol olgusu alındı. Her olguya ADCS-ADL, Modified Older Americans Resources and Services Procedures Instrument (MOARSI), Mini Mental State Examination (MMSE), Clinical Dementia Rating (CDR) ve Global Deterioration Scale(GDS) uygulandı. Demanslılara ve kuşkulu demansı olanlara ek olarak, Alzheimer Disease Assesment Scale-Cognitive Scale

(ADAS-Cog) yapıldı. İç tutarlılık, test-tekrar test tutarlılığı, ayırdedici geçerlilik ve duyarlılık, eşzaman geçerliliği istatistiksel olarak analiz edildi.
Bulgular: ADCS-ADL, AH olanları normallerden ve kuşkulu demanslardan anlamlı düzeyde ayırt etti (p:0.0001). Ayrıca demans evrelerine duyarlı bulundu (p:0.01). AH grubunda ADCS-ADL skoru ile MMSE (r:0.736), CDR (r:0.758), CDR toplam (r:0.828), GDS (r:0.743), MOARSI'nın temel günlük yaşam aktiviteleri bölümü (r:0.826) ve MOARSI'ın enstrümental günlük yaşam aktiviteleri bölümü (r:0.826) skorları arasında anlamlı korelasyon saptandı. ADAS-Cog ile korelasyon düşük (r:0.191) bulundu. ADCS-ADL iç tutarlılığı; AH, kuşkulu demans ve kontrol grubunda sırasıyla, α :0.937, 0.719, 0.758 bulundu. Test-tekrar test tutarlılığı oldukça yüksek (ICC=0.998) saptandı.
Sonuç: Bu çalışma, ADCS-ADL'nin Türkçe uyarlamasının, Türk toplumunda bulunan Alzheimer hastalarının değerlendirilmesi ve takibinde geçerli ve güvenilir bir ölçek olduğunu göstermiştir.

Anahtar Kelimeler: Alzheimer hastalığı, günlük yaşam aktiviteleri, ADCS-ADL, geçerlilik-güvenilirlik

INTRODUCTION

Main clinical presentation of Alzheimer disease(AD) is characterized with cognitive disorders, behavioral-psychiatric disorders and as a result of these impairment of Activities of Daily Living (ADLs). Therefore, cognitive, behavior, ADLs and dementia rating scales are used to asses the conditions of demented patients.

One of the objectives of the Alzheimer (AH) therapies is to maintain patients' functions for a longer time. Therefore, any changes in ADLs performances are used secondary output in pharmaceutical researches[8,13]. ADLs are grouped in two categories: Basic activities of daily living (BADLs) and instrumental activities of daily living (IADLs). BADLs consist of self-care abilities, like dressing, eating bathing, grooming by oneself, controlling micturition and defecation. IADLs consist of more complicated abilities, such as money management, using the phone, driving, preparing meals and shopping[2]. First impairments of AD are observed in IADLs. Later, the disease affects BADLs. Patients become completely dependent upon their caregiver in the late stages of the disease.[2]

Many scales including Alzheimer Disease Cooperative Study-Activities of Daily Living Scale (ADCS-ADL)[5] have been developed to measure the ADL performances of demented patients. Using most of these scales in clinical trials is associated with some limitations. Therefore, Alzheimer's Disease Cooperative Study group have developed this scale. ADCS-ADL is a disease specific scale and commonly used in studies related with AD.

A scale must be adapted into the native language and the culture of the society in which it is applied, and its validity and reliability should be satisfied in order to be used confidently in patients' follow-ups and medical studies. There is not any published study on the Turkish adaptation and validity-reliability of the ADCS- ADL. The aim of the study is to adapt the ADCS-ADL into Turkish language and to explore its validity and reliability in measuring the ADLs of the patients with AD in the Turkish society.

MATERIAL AND METHODS

ADCS-ADL:

The ADCS-ADL is a specific scale for AD which assesses ADLs[5]. Its latest original version is comprised of 23 questions. While six of them are to assess basic ADLs, 17 of them are to assess instrumental ADLs and more complicated ADLs. The questions are answered by the caregiver (Spouse, adult childeren, primary

caregiver etc.). They examine which activities are made by the patient in last four weeks and to what extent s/he made them by herself/himself. Each item has been scored hierarchically from the fully independent to the fully dependent. Total score is calculated by summing the scores of each item. It is between 0 and 78, and the lower scores indicate the dependency.

Turkish Adaptation Methodology:

The study was approved by the local ethical committee of the University of Medical Faculty. The necessary permissions were received from the ADCS researchers. ADCS sent the latest version of the scale as well as the permission document. Two independent forward translations into Turkish were performed by two native neurologists. Both translators were blind for the other's translation text. Then the scale was evaluated and combined by an independent Public Health (M.D) researcher who is highly skilled on scale development and fluent in English. He affirmed the conceptual compatibility of the scale with its original version. Cognitive debriefing sessions (face-to-face interviews focused on the conceptualization and colloquialism of the Turkish translation) were conducted on several older adults. None of the items were found conceptually different from the original, except some minor requirements on the wording of the instrument

Subjects & Field Testing:

Thirty-two AD patients diagnosed according to the National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's Disease and Related Disorders Association's (NINCDS- ADRDA)[11] criteria; 31 subjects as “non-demented control group members” and 10 subjects as “suspected dementia” cases who have memory complaints but do not meet the dementia criteria with 0.5 score of CDR were enrolled for this study. In selecting the patients and the control group members, patients having cerebrovascular disease, Parkinson disease, other degenerative diseases of central nerves system, major depression or other psychiatric diseases, alcohol addiction, metabolic problems affecting the mental situation, and any lung or heart disease leading hypoxia were excluded from the study. The control group members with similar age, gender and educational status were recruited among the relatives or friends of the patients or researchers. All members of the control group were also free of any cognitive disorders. Written informed consents were taken from all subjects and/or the patients' relatives.

Instruments and examinations applied to the respondents during Field Testing stage:

The ADCS-ADL[5], the Activities of Daily Life and Instrumental Activities of Daily Living Scales of the Modified Older Americans Resources and Services Procedures Instrument (MOARSI)[3], the Turkish adapted version[7] of the Standardized Mini Mental State Examination (MMSE)[4], the Clinical Dementia Rating (CDR)[9,12] and finally Global Deterioration Scale (GDS)[14] were applied to all subjects. The ADAS-Cog[10], whose Turkish adaptation is proved to be valid and reliable[15], was also applied to the Alzheimer patients in early or middle stages and the suspicious demented patients. The tests were all applied to the subjects and caregivers by face-to-face interviewing method.

Due to the normal diagnosis procedure and detecting any potential co-morbid conditions, all patients were applied a number of medical diagnostic procedures such as fasting glucose tests, kidney function tests, liver function tests, thyroid hormone tests and some routine tests including total blood count analyses, and calcium(Ca), phosphore (P), vitamin B12 and folic acid levels. At the same time computerized tomography or magnetic resonance imaging scans were applied to the cases.

Statistical Analysis (Reliability-Validity analysis):

Statistical analysis consists of reliability and validity analyses. Reliability of the Turkish ADCS-ADL was tested by test-retest reliability and internal consistency approaches. The Turkish version of the ADCS-ADL was applied on 16 patients with AD and 20 control group members at baseline period and after one month interval to measure the test-retest reliability. The Intra-class Correlation Coefficient (ICC) was used to asses the test-retest reliability. Internal consistency of the scale was tested by Cronbach's alpha value. Cronbach's alpha value indicates the degree of consistency (variance) among items of the scale resulting a range between 0.0 to 1.0, a good internal consistency refers to a closer alpha value to 1.0. Cronbach alpha values were also used to test the item success of the ADCS-ADL. This means that repeated alpha calculation were done when each item deleted from the scale. If the alpha value was calculated higher when an item were removed from the scale then this indicates that that individual item makes a negative contribution to the internal consistency. In other words this item is a problematic item.

Validity of the Turkish ADCS-ADL was tested by Criterion (external validity) and Convergent validity approaches. CDR levels (0.5, 1,2 & 3) were used as criterion for the severity of AD. Control Group of this study was regarded as CDR level "0" during criterion validity analyses. CDR 0,5 means suspected demented patients (mild cognitive impairment), CDR levels 1, 2 and 3 represent early, modest and severe stages of AD, respectively (Table 1). Comparison of the ADCS_ADL scores on the CDR level groups of respondents might also be regarded as sensitivity of the ADCS-ADL scores on the disease severity. Convergent validities were tested by applying accompanying scales such as MOARSI (BALD and IADL)[3], MMSE[4,7], CDR[9,12], GDS[14] and ADAS-Cog[10,15] scales.

Non parametric tests such as Mann Whitney U and Kruskall Wallis ANOVA were used for group comparisons. Post Hoc comparisons were done by Bonferoni where necessary. Correlation of the ADCS-ADL with other scales was analyzed via the Spearman Non-Parametric correlations.

Statistical analyses were done by using SPSS 10.00 statistical program and statistical significance level was set as $p < 0,05$.

RESULTS

Descriptive:

No significant differences could be detected between patients with AD, suspected demented patients and healthy control group members in terms of age, education or gender (Table 1).

Reliability:

Internal consistencies of the ADCS-ADL Turkish version were found quite satisfactory among different groups of severity of AD and among overall subjects (Table 2). Alpha values obtained by applying "if item deleted approach" indicated that the items of walking (second question) might be somewhat problematic items since alpha values increased (improved) when this item was deleted during the analysis. In addition to this, item – total correlation coefficients showed that, 2nd (walking), 20th (reading) and 21st (writing) items revealed poorer correlations with the overall scale score (Table 2).

Test- retest reliability of the scale examined via the ICC test was perfect for the overall study sample. ICC was found as 0.998 (with a 95% confidence interval of 0.997- 0.999).

Validity:

a- Socio-demographic comparisons for ADCS-ADL scores

It was found that both gender and education had no significant effect on ADCS-ADL score. Nevertheless, ADCS-ADL score was lower in women than the

score in men; and ADCS-ADL score improves as the level of education increases (Table 3). Age was inversely related with ADCS-ADL score (r: -0.335, p: 0.061).

b- Criterion Validity and Sensitivity testing

Criterion validity of ADCS-ADL was tested by using Alzheimer CDR stages. Suspicious demented patients were not statistically different from healthy controls. As the CDR stages got worse ADCS-ADL scores significantly decreases gradually. Similar trends were identified with MOARSI Basic (BADL) and Instrumental (IADL) ADL Scores upon CDR Stage (Table 4).

Although ADCS-ADL could not differentiate the suspected demented patients (CDR: 0.5) from the normal subjects (CDR: 0), it could differentiate the suspected (CDR: 0.5) demented patients, mild demented patients (CDR: 1), modest demented patients (CDR: 2) and severe demented patients (CDR: 3) from each other significantly. BADL section of the MOARSI, however, could differentiate only stages of 1, 2 and 3 from each other but could not differentiate normal subjects, suspected demented patients and early staged Alzheimer patients from each other. While the IADL section assessing more complicated activities of living could differentiate normal subjects, suspected demented patients, mild demented patients and modest demented patients from each other, it could not do so between modest and sever stages.

c- Convergent Validity

Convergent validity of the ADCS-ADL was tested by using MOARSI daily living (BADL,IADL), cognitive scales (SMMSE, ADAS-Cog) and dementia rating scales (CDR, CDR Total and GDS) (Table 5). It was seen that the ADCS-ADL scale is highly correlated with these scales' scores except ADAS-Cog.

Table 1- Socio-Demographic Characteristics of Suspicious Demented (CDR 0.5), AD Subjects and normal controls.

		n	Age (mean ±SD)	Education Years (Mean±SD)	Female (%)	Male (%)
Controls**		31	68.38±8.82*	5.74±4.31*	58,10***	41,90***
CDR 0.5**		10	72,20±9,30*	7.80±4.80*	60,00***	40,00***
AD**	CDR 1	13	68,92±10,91	5.38±3.59	38,5	61,5
	CDR 2	10	73,40±10,43	5.00±3.46	60.0	40.0
	CDR 3	9	76,88±9,33	5.00±4.87	77,8	22,2
	Total	32	72.56±10.55	5.16±3.83	56.3***	43.7***

* Mann Whitney U (p>0.05) ** Kruskall Wallis ANOVA (p>0.05) *** Chi Square test (p>0.05)

Table 2- Internal Consistency and item – total correlations of ADCS-ADL Scale.

	AD (n= 32)	Overall Group (n= 73)	Item - total correlationsfor ADgroup (n=32)
Cronbach Alpha	0.938	0.962	
If item deleted:			
Q1 (eating)	0.936	0.961	0.60
Q2 (walking)	0.939	0.964	0.39
Q3 (Toilet)	0.935	0.961	0.70
Q4 (Bathing)	0.931	0.958	0.89
Q5 (Grooming)	0.934	0.961	0.76
Q6 (Dressing)	0.935	0.960	0.82
Q7 (telephone)	0.935	0.959	0.67
Q8 (TV)	0.935	0.960	0.66
Q9 (Talking)	0.933	0.960	0.79
Q10 (Dishes)	0.935	0.960	0.67
Q11(finding belongings)	0.935	0.960	0.66
Q12 (preparing beverage)	0.933	0.959	0.74
Q13 (preparing food)	0.935	0.960	0.65
Q14 (Disposing garbage or litter)	0.933	0.959	0.76
Q15 (Getting around outside)	0.934	0.959	0.73
Q16 (go shopping)	0.935	0.960	0.63
Q17 (keeping appointments)	0.934	0.959	0.69
Q18 (leaving away from home)	0.935	0.960	0.65
Q19 (talking about current events)	0.933	0.959	0.78
Q20 (Reading)	0.938	0.962	0.40
Q21 (Writing)	0.938	0.962	0.35
Q22 (Hobbies)	0.937	0.962	0.52
Q23 (household appliance)	0.936	0.960	0.66

Table 3- Comparison of the ADCS-ADL scores among patients in some socio-demographic sub-categories.

	ADCS-ADL mean±SD	**p**
Gender		
Male (n:14)	41.85±15.96	>0.05*
Female (n:18)	33.78±19.87	
Level of Education		
Literate (no school graduation) (n:10)	29.3 ±18.6	
Primary school graduate (n:13)	38.9 ± 19.8	>0.05**
Secondary School graduate or higher (n:9)	43.9 ± 14.5	

* Mann Whitney U
** Kruskall Wallis ANOVA

Table 4- Criterion validity (sensitivity) of ADCS-ADL by CDR Stage and changes in MOARSI Basic (BADL) and Instrumental (IADL) ADL Score upon CDR Stage

	Controls	Suspicious demented (CDR stage 0.5)	Alzheimer Patients CDR stage 1	CDR stage 2	CDR stage 3	P* (post hoc)**
ADCS-ADL	72.4± 5.3	68.4±7.0	51.9±10.3	35.4±15.5	18.3±11.4	(Susp.= Controls)>1>2>3
BADL	0.03±0.2	0.2±0.6	1.6±0.79	3.8±2.7	7.6±4.6	(Susp.= Controls= 1) <2 <3
IADL	0.29±0.90	1.8±1.7	10.1±2.0	12.9±1.1	14.0±0.01	Controls < Susp. <1< (2=3)

*Kruskall Wallis ANOVA (p<0, 0001)
**Bonferoni (as critical p=0.015)

Table 5- Convergent validity of the ADCS-ADL was tested by using MOARSI daily living (BADL,IADL), SMMSE, ADAS-Cog, CDR, CDR Total and GDS)

	BADL	**IADL**	**MMSE**	**CDR**	**CDR total**	**GDS**	**ADAS-COG**
ADCS-ADL	0.826	0.826	0.736	0.758	0.828	0.743	0.191

*Spearman's Rho

DISCUSSION

The Turkish adaptation of ADCS-ADL is identical with the original scale, except there are some minor changes on the wording of the instrument. Its takes 30-45 minutes to apply. Instructions of the scale are very well structured and quite standardized. It is administrated by a rater interviewing with caregiver face to face or by telephone.

In this study, the internal consistency of the Turkish adaptation of the ADCS-ADL scale was found quite satisfactory (Table 2). Alpha values were calculated again when each of the items deleted from the scale. Item deleted alpha values showed that the 2nd item (walking) of the ADCS-ADL scale revealed a borderline problem with the scale total score. This item was also poor correlated with the total score which indicates that this 2nd item would be a problematic item. There are also two other items (item 20th question- reading, and of item 21 -writing) having poor correlations with the total score of the ADCS-ADL scale. Since the alpha values did not increased when these items were deleted , we can not conclude that these two items would be strongly problematic items as in item 2. No data was available about the internal consistency in the original study[5].

Test-retest consistency of the ADCS-ADL was found quite high (ICC: 0.998 for total score). κ values were reported between 0.40-0.75 for subscale scores in the original study.[5]

When the ADCS-ADL's capacity of differentiating the cases according to the CDR stages, it was seen that the scale could differentiate the suspected demented patients (CDR: 0.5), the early staged patients (CDR: 1), the middle staged patients (CDR: 2), and the later staged patients (CDR: 3) from each other. On the other hand it couldn't differentiate the suspected demented patients (CDR: 0.5) from the control group members (CDR: 0) (Table 4). According to the BADL section of the MOARSI, however, could differentiate only stages of 1, 2 and 3 from each other but could not differentiate control group members, suspected demented patients and early staged patients with AD from each other (Table 4). While the IADL section assessing more complicated activities of living could differentiate control group members, suspected demented patients, mild staged and middle staged demented patients from each other, it could not do so between middle stages and later stages (Table 4). These are all expected results. Since the instrumental activities of daily living include more complicated operations, they are affected even during the early stage of dementia. Yet, basic activities of daily living deteriorate in the latest stages. The ADCS-ADL scale assesses both basic activities of daily living and instrumental activities of daily living. In accordance with this feature, the profile on differentiating the cases according to the CDR stages is between the basic ADL scale and the instrumental ADL scale. ADCS-ADL could differentiate the stages of dementia from each other while differentiating the demented subjects from the normal subjects and the suspected demented subjects. But, it couldn't differentiate the suspected demented patients (CDR: 0.5) from the control group members (CDR: 0). Usually, generic ADLs scales couldn't differentiate subjects with minimal cognitive impairment from normal subjects. Galasko et al. developed the Activities of Daily Living-Prevention Instrument (ADL-PI) for prevention trials[6]. It could discriminated between subjects as CDR: 0 and CDR: 0.5.

In order to assess the concurrent validity of ADCS-ADL, its correlation with basic and instrumental sections of the MOARSI-ADL and with two cognitive scales, SMMSE and ADAS-Cog, were examined. Furthermore, its correlation with two dementia rating scales, CDR and GDS,

were tested statistically (Table 5). ADCS-ADL's correlation with both basic activities of daily living and instrumental activities of daily living of MOARSI-ADL was found quite high (r: -0.826). ADCS-ADL was found in a good correlation with SMMSE (r:0.736). When one-by-one correlation of SMMSE with the sub-questions of ADCS-ADL was examined, significant correlation between r: 0.351 and r: 0.803 was observed in all activities other than the activities of walking, clearing dirty dishes from the table and writing. Correlation between ADCS-ADL and SMMSE was also examined in the original study and the correlation coefficient was reported in the intervals of 0.28 and 0.70[5].Activities indicating lower correlations were removed from the scale. The activity of "walking" takes part in and has indicated the lowest correlation both in the original version and our study. No significant correlation was found between ADCS-ADL and ADAS-Cog. Low level of correlation with ADAS-Cog has probably been caused by the fact that the Alzheimer patients in late stages could not complete the test (GDS: 6-7) and their scores were out of the statistical assessment. Many researchers have reported correlation between functional impairment and cognitive deficits[1]. However, cognition and functional disorder should be assessed separately. ADCS-ADL also indicated similar high levels of correlation with the dementia rating scales, CDR and GDS, with r: 0.758 and r:0.743, respectively. Higher correlation was found with the total score of the CDR boxes (r: 0.828). All these high correlation coefficients indicated that the concurrent validity of ADCS-ADL is quite high.

When the relation of ADCS-ADL with demographic characteristics was assessed, it was found that women got lower scores than men in the demented group but in statistically negligible levels (Table 3). In developing the original scale, any item which could cause partiality in terms of sex was avoided. For example, the housework items were selected so as to be unaffected or affected quite slightly by sexual differences[5]. However, some such differences were observed in our study because of the socio-cultural characteristics of the Turkish society. For example, when male subjects could not get higher scores in some specific ADLs, such as preparing meal or hot drink and using home instruments, female subjects could not get higher scores in outdoor activities, such as shopping or travelling. After all, when other factors that could cause such difference were examined, it was found that women are suffering from more severe dementia symptoms. And the mentioned difference was connected to this finding.

When the relation of ADCS-ADL with age was examined, weak(r: -0.335) correlation was found. The higher the age was, the worse the score was. Lowering performance in daily living activities with aging can be attributed to the aging itself. For example, visual disorders resulting from aging could cause deficiencies in reading or in activities requiring delicate abilities. Or degenerative joint diseases and pains, which increase when getting older, could make patients go away from outdoor activities partially or completely. Due to Turkish social characteristics, older people could be banned to make some activities, such as cooking, dish washing, house cleaning or shopping, by their relatives. This could cause older people's distraction from some ADLs in Turkish society, be they are demented or non-demented.

Any significant correlation was found between education level and ADCS-ADL scores (Table 3). It was observed, however, that subjects having lower education levels got lower ADCS-ADL scores.

Limitation of the study is that the number of cases is not high enough to be able to make some parametric analyses. Besides, this could hide some correlations that are potentially significant in sub-group analyses.

In conclusion, the present study shows that the Turkish version of ADCS-ADL is a valid and reliable scale to assess the Alzheimer cases in our society. The Turkish version of ADCS-ADL could be used in any dementia studies and clinical practices in Turkey.

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Received by: 08 August 2010
Revised by: 15 December 2010
Accepted: 16 December 2010

The Online Journal of Neurological Sciences (Turkish) 1984-2011
This e-journal is run by Ege University Faculty of Medicine,
Dept. of Neurological Surgery, Bornova, Izmir-35100TR
as part of the Ege Neurological Surgery World Wide Web service.
Comments and feedback:
E-mail: editor@jns.dergisi.org
URL: http://www.jns.dergisi.org
Journal of Neurological Sciences (Turkish)
Abbr: J. Neurol. Sci.[Turk]
ISSNe 1302-1664

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