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Assessment of Hand Functions in Patients with Chronic Hepatitis B

ORIGINAL INVESTIGATION

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ABSTRACT

Objective: Motor dysfunction is an important clinical finding in patients with liver cirrhosis (LC), but there is no study assessing fine motor coordination in patients with chronic hepatitis B (CHB). We aimed to investigate hand functions and fingertip dexterity in patients with CHB.

Materials and Methods: A total of 17 female and 15 male patients diagnosed with CHB without histopathological findings of cirrhosis were enrolled to the study; 21 female and 9 male healthy volunteers were included as a control group. Hand grip strength was assessed by Jamar hand dynamometer. Three kinds of pinch strength of fingers were assessed by Jamar pinchmeter. Functional status was evaluated by using the Stanford Health Assessment Questionnaire (HAQ). Duruoz Hand Index (DHI) was used to assess the hand functions. Fingertip dexterity was evaluated by Purdue pegboard test.

Results: Bilateral hand grip strength and pinch strength were not statistically different from controls ($p>0.05$). There was also no significant difference between the categories of the Purdue pegboard test between the groups. HAQ scores of patients were higher than controls ($p<0.05$).

Conclusion: Hand functions are not influenced in patients with CHB. Disruptions in the functional status of patients with CHB may be due to fatigue and depression, which are usually seen in chronic liver diseases.

Key words: Chronic hepatitis B, hand functions, functional status

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INTRODUCTION

It is suggested that patients with liver cirrhosis (LC) have the risk of losing muscle mass due to decreased protein synthesis and myofibrillar degradation that results from motor impairment (1-3). Motor dysfunction is an important clinical finding in patients with LC, and its pathogenesis is not clear (4). Recent studies have revealed that motor impairment may occur in cirrhotic patients, even without hepatic encephalopathy (HE) (5). To the best of our knowledge, there is no study assessing fine motor coordination and hand functions in patients with chronic hepatitis B (CHB) without the findings of LC; thus, we aimed to study the hand functions, fingertip dexterity, and hand co-ordination in patients with CHB without the findings of LC.

MATERIALS and METHODS

Patients

Seventeen female and 15 male patients with CHB were followed by the polyclinics of microbiology and infectious diseases of Dicle University Faculty of Medicine, which decided to perform biopsy for the initiation of medical treatment of those diagnosed with CHB randomly enrolled to the study; 21 female and 9 male patients were included as healthy controls (HC). The demographic data were obtained along with the details of duration of the disease, hand dominance, and body mass index. Patients were excluded if they had a history of neurological disorders of the upper extremities, diabetes mellitus, prior surgical intervention of the hands, contractures or amputations of the upper limbs, and a history of any substance abuse. Complete blood count, blood urea nitrogen, aminotransferases, glucose, cholesterol, uric acid, albumin, total protein, alkaline phosphatase, and hepatitis B virus DNA (HBV DNA) were examined in blood. Patients who were coinfected with hepatitis D virus were also excluded from the study.

The study was approved by the local ethics committee and is in accordance with the Declaration of Helsinki. All subjects gave their written informed consent prior to the study.

Assessment of the hand functions and the fingertip dexterity

Grip strength was assessed for the dominant hand (DH) and nondominant hands (NDH) for each patient by JAMAR hand dynamometer (JA Preston Corp, Ontario, Canada). Tip pinch, lateral pinch, and chuck pinch of the hands

were assessed by JAMAR pinchmeter. The measurements were carried out while the patients were sitting. Shoulders were adducted and naturally rotated. Elbows were flexed at 90°, and forearms were positioned in neutral position. Grip and pinch strengths of hands were measured three times with 30-second intervals for both hands, and the average measurement was noted for each participant (6, 7).

Pinch strength was measured for both hands using a pinchmeter. Lateral, tip, and chuck pinch strengths were measured as in the hand grip strength measurement procedure. The doctor showed the suitable position first; then, the participants pinched as strong as they could for the three forms of pinch strength (8).

Fingertip dexterity and hand coordination was assessed by the Purdue Pegboard Model # 32 020 (Lafayette Instrument Company, IN, USA). Assessments by the Purdue Pegboard were carried out in 3 parts. The first part included picking up pins with the DH and placing them into grooves, starting from the top groove, in 30 seconds. The same process was repeated with the NDH in the second part, and finally, the third part included an assembly test. Participants were allowed to practice each test 4 or 5 times to ensure that they understood the procedure completely. In the first and second parts of the test, the number of pins that were picked up and placed into grooves was noted. In the assembly test, there were pins, collars, and washers. One pin was picked up with the DH and was placed in the top groove in the DH row; then, a washer was picked up with the NDH and was placed over the pin. A collar was picked up with the DH and dropped over the pin. While the collar was being dropped over the pin, another washer was picked up with the NDH and was dropped over the collar. This was numbered as the first assembly, and then, the same procedure was repeated for the next groove. The patients were given 60 seconds for the assembly test, and the number of assemblies was noted as the assembly test score (7).

Duruoz Hand Index (DHI) was used for the assessment of hand functions. It includes 18 questions of activities of daily living, which are categorized into 3 groups of factors. The first factor represents activities requiring force and rotational motions, the second factor represents activities requiring dexterity and precision, and the third factor represents dynamic activities requiring flexibility of the first 3 fingers. Each item is scored on a 6-point Likert scale (0-5), and the patients are questioned according to their experience related to these questioned during the last week (9).

Assessment of the physical functions of the subjects

Stanford Health Assessment Questionnaire (HAQ) was used for assessing the functional status of the patients. This scale is used for assessing daily activities. The HAQ is composed of 20 items that include eight functional categories with a score range of 0–3 (index), with higher scores indicating more disability. Activities are marked as 0: no limitation; 1: mild limitation; 2: severe limitation; and 3: complete limitation. All patients' HAQ scores were calculated and noted (10).

The study was approved by the local ethics committee and is in accordance with the Declaration of Helsinki. All subjects gave their written informed consent prior to the study.

Statistical analysis

For differences between the groups in nominal variables, chi-square test was used. For numerical variables, we used the independent t-test. The Statistical Package for the Social Sciences version 18.0 for Windows (SPSS Inc., Chicago, IL, USA) was used for data analysis.

RESULTS

Thirty-two patients (17 females, 15 males) with a mean age of 48.46±16.72 and 30 patients (21 females, 9 males) were included in the CHB group. The mean age of the control group was 47.26±17.87. The DH was right, except for one patient in the control group. Table 1 shows the demographic characteristics of the patients. The average duration of HBsAg seropositivity was 53.53±54.11 months, and none of the patients was receiving medical therapy.

Half of the patients (50%) reported pain in the DH versus 28.2% in the NDH in the CHB group. In the control group, the percentage of hand pain was 36.6% and 20% for the DH and NDH, respectively.

The mean hand grip strength in the CHB group and HC for the DH was 29.75±6.26 and 31.57±5.64 kg, respectively. In the statistical comparison of the hand grip strengths, we could not find any difference between the groups ($p>0.05$). Additionally, we could not demonstrate any differences in any pinch strength between the groups for the ND and NDH ($p>0.05$). DHI scores in patients with CHB was 4.46±4.95, and it was not significantly different from the HC, with a mean of 3.50±5.52 ($p>0.05$). The score of the

Table 1. Demographic and clinical characteristics of subjects

	Patients with CHB	Healthy controls	p
Age (mean±standard deviation)	48.46±16.72	47.26±17.87	NS
Female/Male	17/15	21/9	NS
Weight (kg) (mean±standard deviation)	66.56±12.71	67.33±10.84	NS
Height (cm) (mean±standard deviation)	166.68±8.24	164.03±5.90	NS
Duration of disease (month) (mean±standard deviation)	53.53±54.11	-	
Dominant hand (Right/Left)	32/0	29/1	NS
Morning stiffness (Present/absent)	9/23	6/24	NS

CHB: Chronic hepatitis B; NS: Not significant

Table 2. Demographic and clinical characteristics of subjects

Clinical parameters	Patients with CHB Mean±standard deviation	Healthy controls Mean±standard deviation	p
DH grip strength	29.74±6.26	31.57±5.64	0.186
NDH grip strength	27.06±6.36	29.78±5.47	0.060
DH lateral strength	8.62±1.95	8.80±1.78	0.468
NDH lateral strength	7.94±1.93	8.21±1.77	0.499
DH tip strength	6.42±1.58	6.82±1.45	0.188
NDH tip strength	5.87±1.40	6.44±1.35	0.097
DH chuck strength	7.70±1.98	7.82±1.65	0.322
NDH chuck strength	7.14±1.67	7.54±1.53	0.537
DH Pin test	10.90±2.54	12.16±2.52	0.058
NDH Pin test	10.29±2.77	11.33±2.10	0.118
Assembling test	6.37±2.12	6.66±0.85	0.515
Duruoz hand index	4.46±4.95	3.50±5.52	0.154
HAQ	0.77±0.72	0.19±0.32	0.001

DH: Dominant hand; NDH: Non-dominant hand; HAQ: Health Assessment Questionnaire

pin test and assembly test for the assessment of fingertip dexterity was not significantly different from the HC. These results are summarized in Table 2.

HAQ scores of patients with CHB (0.77±0.72) were significantly higher than HC (0.19±0.32), and this difference was statistically significant ($p<0.001$).

DISCUSSION

Previous studies assessing motor dysfunction in patients with LC have determined that cirrhosis-associated motor dysfunction is accompanied with deficits in control of fine hand and finger movements, but there is no study assessing the hand functions and fingertip dexterity in patients with CHB (4). To the best of our knowledge, this is the first study assessing hand strengths and fingertip dexterity in patients with CHB. Hyperammonemia may cause astroglial dysfunction and results in motor deficits due to causing cerebral dysfunction in patients with LC (11). On the other hand, loss of muscle mass can be caused by quality impairment of the muscles (1). Möller et al. (12) suggested that decreased muscular levels of energy-rich phosphagens in cirrhotic patients may cause impaired motor function. One of the probable reasons of the motor impairment in patients with LC may be associated with the low levels of magnesium in striated muscles and increased protein degradation in these patients (3, 13). Mechtcheriakov et al. (4) showed the substantial deterioration of handwriting movements in patients with LC. Mechtcheriakov et al. (4) also showed that clinical bradykinesia in patients with LC may be associated with deficits in fine hand and finger movements regarding the previous studies that suggest that patients with LC may show clinical bradykinetic syndrome (14, 15). Butz et al. (5) revealed that patients with LC but without any clinical or neuropsychometric signs of hepatic encephalopathy show motor impairments. Vigil et al. (16) reported that patients with hepatitis C had greater declines in both physical and instrumental activities of daily living, whereas impaired fine motor coordination was associated with both of them.

In our study, we can not indicate any impairment related to hand functions and fine motor coordination in patients with CHB. All parameters in the CHB group were lower than the control group, but this difference except for HAQ was not statistically significant. These results may be due to the absence of probable mechanisms of motor impairment and pathophysiologic mechanisms in patients with CHB that were suggested in cirrhotic patients. We investigated if there was any restriction in the daily life of patients with CHB and found significantly higher HAQ scores compared to HC. We could not find any assessment by using the HAQ in patients with CHB in Pubmed searches. Wu et al. (17) and Wang et al. (18) found lower SF36 scores in patients with CHB compared to HC. The disruptions in functional status of patients with CHB may be due to fatigue and depressive symptoms because of having a chronic disease; on the other hand, it was suggested that management of depressive symptoms and fatigue may lead to improvement in functional status and quality of life in patients with chronic viral hepatitis (19).

CONCLUSION

There is no impairment in hand functions and fine motor coordination in patients with CHB in contrast to patients with cirrhosis and hepatitis C. On the other hand, they experience more restrictions in their daily life compared to healthy people. The most important limitation of our study was having a small sample size; thus, new studies with larger sizes are required.

Ethics Committee Approval: Ethics committee approval was obtained for this study from the ethics committee of Dicle University Faculty of Medicine.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Authors' Contributions: Conceived and designed the experiments or case: PO, RT, FU. Performed the experiments or case: SE, RT, MY. Analyzed the data: PO, MB. Wrote the paper: MÇ, RT, KN. All authors read and approved the final manuscript.

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