■ Research Article

The course of cognitive functions in geriatric patients with musculoskeletal pain receiving acupuncture: an observational study

Kas iskelet ağrısı akupunktur ile tedavi edilen geriatrik hastalarda kognitif fonksiyon gidişatı: gözlemsel bir çalışma

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Abstract

Aim: Acupuncture is safe and effective in treating older patients with chronic musculoskeletal pain. Its effect on geriatric conditions has yet to be precisely investigated. We aim to understand the role of acupuncture on chronic musculoskeletal pain and better define its reflection on elderly patients' daily life.

Material and Methods: 23 elderly patients received ten acupuncture sessions in 8 weeks for chronic musculoskeletal pain for our non-randomised observational study. Visual Analogue Scale (VAS), Geriatric Depression Scale (GDS), Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), Cohen-Mansfield Agitation Inventory (CMAI), Mini-Mental Score Examination (MMSE) were used.

Results: VAS score was 7.65±1.82, which decreased significantly to 4.36±2.24 after treatment (p<0.001). MMSE mean before was 23.26±5.50 and increased considerably after treatment, reaching 25.45±3.98 (p<0.001). GDS mean score was 11.65±8.83, which reduced significantly to 8.45±6.83 afterwards (p<0.001). CMAI mean score before treatment was 40.87±10.21, which decreased substantially to 35.86±8.45 (p<0.001). ADL mean score before treatment was 5.35±0.71 and significantly increased to 5.77±0.43 (p=0.002). IADL score before treatment was 6.70±2.08 and was 6.73±2.07 after treatment (p=0.317).

Conclusion: Acupuncture treated pain and provided secondary gain to these patients improving their MMSE, GDS, CMAI, and ADL. These findings suggest that acupuncture analgesia for musculoskeletal pain in older adults improves their geriatric problems.

Keywords: cognitive functions, acupuncture, chronic pain, elderly

Öz

Amaç: Akupunktur, kronik kas-iskelet ağrısı olan yaşlı hastaların tedavisinde güvenli ve etkilidir. Geriatrik rahatsızlıklar üzerindeki etkisi henüz tam olarak araştırılmamıştır. Akupunkturun kronik kas-iskelet ağrısı üzerindeki rolünü anlamak ve yaşlı hastaların günlük yaşamına yansımasını daha iyi tanımlamayı amaçlıyoruz.

Gereç ve Yöntemler: 65 yaş üstü 23 hasta non-randomize gözlemsel çalışmamıza dahil edildi. Bu hastalara kronik kas-iskelet ağrısı için 8 hafta içerisinde toplam on akupunktur seansı uygulandı. Semptomları değerlendirmek için Vizüel Analog Skala (VAS), Geriatrik Depresyon Ölçeği (GÖS), Günlük Yaşam Aktiviteleri (GYA), Günlük Yaşamın Enstrümantal Aktiviteleri (GYEA), Cohen-Mansfield Ajitasyon Envanteri (CMAE), Mini-Mental Test (MMT) kullanıldı.

Bulgular: VAS skoru 7.65±1.82 iken tedaviden sonra anlamlı bir şekilde 4.36±2.24'e düştü (p<0.001). MMT ortalaması tedaviden önce 23.26±5.50 iken tedaviden sonra anlamlı bir şekilde artarak 25.45±3.98'e ulaştı (p<0.001). GDÖ ortalaması 11.65±8.83 iken tedaviden sonra anlamlı bir şekilde 8.45±6.83'e düştü (p<0.001). CMAE ortalaması tedaviden önce 40.87±10.21 iken tedaviden sonra anlamlı bir şekilde 35.86±8.45'e düştü (p<0.001). GYA ortalaması tedaviden önce 5.35±0.71 iken anlamlı bir şekilde 5.77±0.43'e yükseldi (p=0.002). Tedavi öncesi GYEA skoru 6.70±2.08 iken tedavi sonrası 6.73±2.07 idi (p=0.317).

Sonuçlar: Akupunktur ağrıyı tedavi etmesinin yanı sıra MMT, GDÖ, CMAE ve GYA'lerini iyileştirerek ikincil kazanç sağladı. Bu bulgular, yaşlı yetişkinlerde kas-iskelet ağrısı için akupunktur analjezisinin geriatrik sorunlarını iyileştirdiğini göstermektedir.

Anahtar Kelimeler: kognitif fonksiyonlar, akupunktur, kronik ağrı, yaşlı hastalar

Introduction

The elderly population has increased worldwide, resulting in an increased need for comprehensive medical care. Healthy ageing has become a more and more important concept [1].

Musculoskeletal pain is a common problem with ageing. There are ageing-related changes in the musculoskeletal system, which could be bone loss, cartilage degeneration, decreasing fluid level between intervertebral disks, and changes in muscle fibres' number and size. All of these may, in turn, cause pain in older adults [2,3].

Pain is a symptom that should be evaluated more carefully in geriatric patients. When elderly patients, especially those with dementia, seek pain treatment, it is common for them to have suboptimal management. The reason for not being able to provide optimal pain management for elderly patients with dementia could be related to their speech and memory problems. Knowing that obstacle, these patients should be further questioned regarding their pain, and the clinicians should make more effort to better understand their condition [4].

Regarding the management of musculoskeletal pain, paracetamol is considered the first-line treatment for pain, followed by nonsteroidal anti-inflammatory drugs (NSAIDs), even though NSAIDs have a wide range of side effects. Opioids are the next step for moderate-severe pain, which could again result in serious complications. Possible side effects become more critical in geriatric patients. Hence, the lowest dose is usually preferred when starting pain medication for the elderly [5].

Acupuncture is one of the other pain management tools for musculoskeletal pain. Studies on the safety of acupuncture have shown that it can be considered a safe procedure.6 In addition to being a safe pain killer, it might also have additional benefits, such as improving cognition and behavioural problems in older people. Patients with mild cognitive dysfunction and Alzheimer's disease receiving acupuncture were assessed using a Mini-Mental State Examination (MMSE). Their MMSE scores after acupuncture demonstrated an increase, reflecting their cognitive function improvement. Acupuncture also had a positive impact on cognition and the ability to carry out daily activities in patients with vascular dementia as well. Those findings suggest that acupuncture might be a painkiller with secondary benefits in older people [7-8]. About behavioural problems in dementia, studies investigating the effect of acupuncture on dementia-related behavioural problems are scarce [9-10].

Our observational study aimed to assess how acupuncture treatment for pain could affect cognition, activities of daily living, behavioural problems (such as agitation), and depressive mood in elderly patients while treating musculoskeletal pain. Our hypothesis is that acupuncture for neuromuscular pain in elderly patients with dementia could be part of a pain management plan and might also benefit their geriatric problems.

Material and Methods

Selection and description of patients

The study was conducted in a geriatric outpatient clinic in a research and training hospital in Turkey between October 2017 and October 2018. We included patients 65 years old and older presenting with complaints of neuromuscular pain and forgetfulness. There were 60 patients with complaints of neuromuscular pain and forgetfulness. Among these, the eligible patients were referred to acupuncture therapy. Exclusion criteria were acute neuromuscular pain, end-stage dementia, uncontrolled chronic disease (i.e., hypertension, diabetes mellitus, chronic obstructive pulmonary disease, heart failure), patients with ongoing infection and cancer patients. To assess eligibility, in addition to their medical background, we also evaluated the social conditions of the patients as they would be required to attend the acupuncture sessions by arranging their own transport. After checking for eligibility, 30 subjects were suitable for acupuncture treatment. Among those, 23 patients were willing to attend acupuncture sessions. The diagram below shows participant selection (Diagram 1).
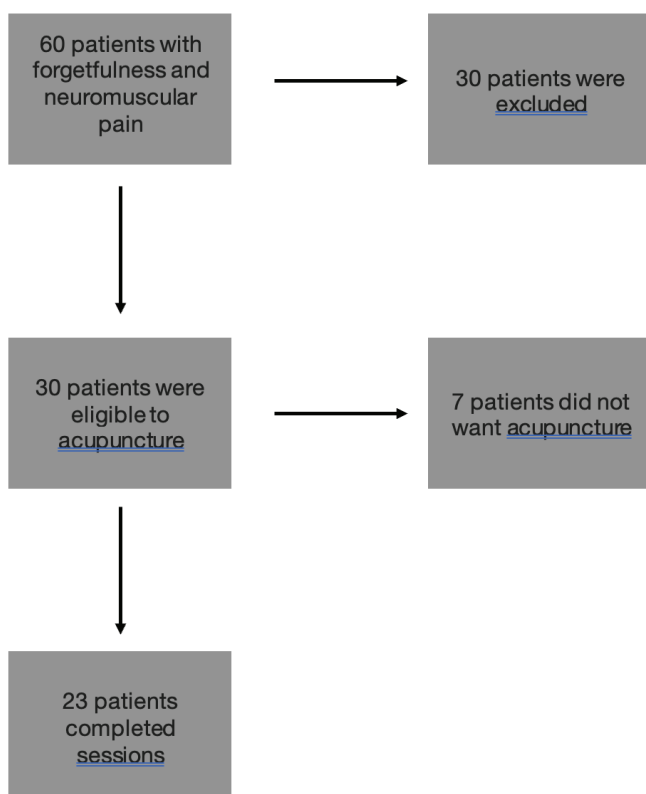

Diagram 1. Participant Selection.

We initially planned to have a control group; however, the research and training hospital where the study was initiated had been closed due to the construction of a new hospital within the area. Hence, a control group could not be arranged, and the study was terminated with only the data from the treatment group.

Data Collecting and Comprehensive Geriatric Assessment

While examining geriatric patients, geriatric conditions should be adequately identified. A comprehensive geriatric assessment can help clinicians manage these conditions and prevent or delay their complications.11 A comprehensive Geriatric Assessment (CGA) was done for every participant. The CGAs were completed by a family practice specialty trainee doctor, under the supervision of a consultant geriatrician. As part of the CGA, age, sex, medical history and medication history were recorded for each patient. We then measured their pain using the Visual Analogue Scale (VAS). In addition to this, we used five scales to help complete the CGA. These scales were the Geriatric Depression Scale (GDS), Activities of Daily Living (ADL), Lawton Brody Instrumental Activities of Daily Living (IADL), Cohen Mansfield Agitation Inventory (CMAI), Mini-Mental State Examination (MMSE). Brief information about those scales and tests is given below in the following paragraphs. The scales were completed by the same clinician completing the CGAs.

GDS comprises 30 yes and no questions. The higher scores the patients have, the more depressive symptoms they have. Above and equal to 11 points means a risk of severe depression [12].

ADL and IADL are scaled to better understand older adults' quality of life. The maximum ADL score is six, meaning the patient is independent with dressing, bathing, toileting needs, mobilising out of bed, eating, and continence. IADL is closely related to ADL; however, it measures more advanced skills. The maximum score is eight, and it assesses the abilities of shopping, meal preparation, domestic duties, transportation, and taking own medications [13,14]. MMSE is the standard test to screen for dementia. The maximum score is 30; scoring between 18-24 means mild dementia, and less than 17 is considered advanced dementia.

CMAI is used to evaluate behavioural changes and levels of agitation. It comprises 29 questions, and each of them is scored from 1 to 7. The agitation behaviour is divided into oral and physical agitation and offensive and non-offensive [15-16].

VAS is a numeric scale in which patients rate their pain from 0 to 10, 10 score being the highest level of pain ever experienced [17].

We also included other subjective feedback from the patients and their caregivers in our study, which is included in a different section.

Acupuncture treatment

A medical doctor holding a Turkish Ministry of Health-approved acupuncture certificate applied acupuncture to the patients. Disposable 0.25mmx0.25mm steel needles were used. The treatment included ten sessions, each session lasting for 20 minutes and delivered over 2 months. Acupuncture points

were selected from systemically effective points and local ach qi points according to Western Medical Acupuncture. Point selection was made individually for every patient. Commonly used acupuncture points were HT7, LU9, LI4, LI11, ST36, SP6, LR3, GV20, Yintang. The depth of needling differed in each patient. According to the fat and muscle mass of the patients, we tried to needle as much as possible, especially at points ST36, SP6, and LI11. If deep needling was not applicable, we preferred superficial needling. There was no additional twirling or any extra stimulation.

Statistical analysis

Statistical analysis was conducted using the Statistical Package for Social Science version 21.0 for Windows (SPSS, Inc.; Chicago, USA). Descriptive data were presented as number (n), per cent (%), mean, standard deviation (SD) and median: Pearson chi-square, Fisher's exact test and McNemar. Chi-square tests were used to compare categorical variables. The results were submitted for the assessment of normality distribution using the Kolmogorov-Smirnov and Shapiro-Wilk tests. At the same time, paired sample t-tests and independent samples t-tests were used to compare continuous variables with normal distribution. Wilcoxon test Mann Whitney U test was used for variables without normal distribution. The relationship between the variables was evaluated with the Spearman Correlation Test. Statistical tests with $p < 0.05$ were accepted as significant.

Results

Main demographic findings

Twenty-three patients were recruited in the acupuncture therapy group. 78.3% of them were female, and 21.7% were male. All the patients were equal to or above sixty-five years of age. The mean age was 73.39±6.47 (minimum=65 and maximum=91). Information regarding sex, marital status, education, and living conditions is shown in Table 1 below.

Table 1. Main Demographic Findings

	n	%
Sex		
Female	18	78.3
Male	5	21.7
Marital Status		
Married	14	60.9
Widow	9	39.1
Education background		
Not Literate	11	47.8
Literate	12	52.2
Living Condition		4
Living with family	10	3.5
Living with spouse	11	47.8
Living alone	2	8.7

Being geriatric patients, co-morbidities were present for every patient. Hypertension was the most common comorbidity (%73.9), followed by cardiovascular disease (%21.7) and respiratory diseases (%21.7). Other co-morbidities and their percentages are shown in the table (Table 2).

Table 2. Comorbidities of the patients

	n	%
Hypertension		
Not present	6	26.1
Present	17	73.9
Digestive Tract Problems		
Not present	20	87.0
Present	3	13.0
Neurological Disease		
Not present	19	82.6
Present	4	17.4
Cardiovascular Disease		
Not present	18	78.3
Present	5	21.7
Diabetes Mellitus		
Not Present	19	82.6
Present	4	17.4
Respiratory System Disease		
Not present	18	78.3
Present	5	21.7
Psychiatric Disease		
Not present	21	91.3
Present	2	8.7
Thyroid Disease		
Not present	21	91.3
Present	2	8.7
Rheumatological Disease		
Not present	22	95.7
present	1	4.3
Orthopaedic Disease		73.9
Not present	17	26.1
Present	6	

The change in the scores before and after treatment

The mean VAS score was 7.65±1.82, which decreased to 4.36±2.24 after treatment (p<0.001). The mean MMSE score was 23.26±5.50 and improved, reaching 25.45±3.98 afterwards (p<0.001). The mean GDS score was 11.65±8.83 and decreased significantly to 8.45±6.83 (p<0.001). CMAI mean score before treatment was 40.87±10.21 and decreased to 35.86±8.45 (p<0.001). ADL mean score before treatment was 5.35±0.71 and 5.77±0.43 after (p=0.002). IADL mean score before treatment was 6.70±2.08 and 6.73±2.07 afterwards (p=0.317). Table 3 shows the change in the mean score of scales before and after treatment.

Table 3. The change in the scores before and after treatment					
	n	Mean±SS	Median	Minimum-Maximum	p*
VAS - before	23	7.65±1.82	8.00	4-10	<0.001
VAS - after	22	4.36±2.24	4.00	0-9	
MMSE - before	23	23.26±5.50	23.00	11-30	<0.001
MMSE - after	22	25.45±3.98	26.00	16-30	
GD - before	23	11.65±8.83	11.00	0-26	<0.001
GD - after	22	8.45±6.83	6.50	0-22	
CMAI - before	23	40.87±10.21	38.00	29-63	<0.001
CMAI - after	22	35.86±8.45	32.50	29-56	
ADL - before	23	5.35±0.71	5.00	4-6	0.002
ADL - after	22	5.77±0.43	6.00	5-6	
IADL - before	23	6.70±2.08	8.00	1-8	0.317
IADL - after	22	6.73±2.07	7.50	1-8	

Subjective Observations

This study also includes subjective observations from the caregivers and our team. The patients' caregivers provided exciting feedback.

One of our patients' friends asked her for the clinic's telephone number after seeing her relieved from her pain and being more confident with her daily activities. Another exciting feedback was from a doctor-daughter of a patient. Her observation was that her mother could walk to the elevator alone in their apartment for the first time (she was hand-held or assisted before).

We also would like to highlight an observation of our team. Some of our patients became sleepy and tired during the treatment. We considered two critical factors in this. One of them is that our clinic was located inside a busy hospital, and it had been tiring for older people to go there frequently. The second reason might be acupuncture itself. We saw that ten acupuncture sessions in 8 weeks were too frequent for geriatric patients. It could have been better to spread those eight sessions to 10-12 weeks.

Discussion

Studies on acupuncture, cognitive functions and behavioural problems are scarce. This study is unique in that it focuses on cognition, behavioural issues such as agitation, depressive symptoms and daily activities, in addition to pain management. It is also one of its kind, assessing acupuncture's effect on agitation, using CMAI as an assessment tool.

There is considerable research on the analgesic effect of acupuncture, in all which side effects are rare compared to oral medication [18,19]. In previous studies that assessed pain management with acupuncture, VAS scores decreased significantly after treatment. Çevik et al. investigated the effect of acupuncture in the treatment of chronic low back and knee pain in geriatric patients. In this study, the mean VAS values of

the patients for low back and knee pain were 8.8696 ± 1.546 and 9.1304 ± 1.4239 before the application, and 2.1739 ± 1.466 and 1.455 ± 0.7 after the application. In our study, in line with the literature, VAS scores were 6 and above in 90.9% of patients before acupuncture but decreased to 31.8% after the procedure. The release of ß-endorphins into the cerebrospinal fluid is one mechanism that explains acupuncture's analgesic effect. Considering the efficacy and safe side effect profile, it is recommended that acupuncture should be tried before oral medications to avoid polypharmacy in the elderly [20].

The improvement in MMSE scores after acupuncture has been shown in other studies, such as Shi et al.'s study on vascular dementia and acupuncture. In that study, with the MMSE, activities of daily living and questionnaires on health quality were assessed in patients receiving acupuncture. They demonstrated improvement after acupuncture treatment [7]. In Another study by Zhou et al., MMSE scores and activities of daily living were assessed during acupuncture therapy. The results were again similar to our study, and acupuncture was considered a safe option [8].

Our study showed no significant side effects and only minor side effects (such as tiredness and localized well-controlled bleeding), suggesting that acupuncture treatment is safe for older people.

Acupuncture's effect on Alzheimer's has been studied in animals and humans. An animal study shows that acupuncture has reduced oxidative stress, increased acetylcholine concentration, reduced hippocampal apoptosis and increased cortical blood flow [21]. Brain structure and neuronal communication changes might help understand acupuncture's effect on cognitive functions. Looking from a holistic approach, once chronic pain is better controlled, it will further affect other systems. As a result of that, the depressive symptoms will improve, it will allow more independence in daily activities, and polypharmacy will be avoided. Which, in turn, will also help preserve cognitive functions.

There has been little research on agitation and acupuncture. A scoping review by Harris M et al, reviewed the existing literature on acupuncture and acupressure for behavioral and psychological symptoms of dementia. They evaluated 15 studies on behavioral and psychological symptoms of dementia which included acupuncture or acupressure therapy. Among those, there is no other study which included acupuncture and measurement of agitation using CMAI scores. In studies which used CMAI as a measure for agitation, acupressure alone or combined with aromatherapy were the treatment methods [22]. Lin et al. used acupressure and Montessori-based activities for dementia patients in a nursing

home. They reported reduced agitation and aggression [9]. Yang et al. have investigated aromatherapy and acupressure on agitation and demonstrated a decrease in agitation with those interventions. They explained this effect via acupuncture's impact on the Ventral Tegmental Area via GABA, which alters dopamine levels in the nucleus accumbens [10].

In our study, patients' agitation levels decreased significantly after acupuncture treatment, and this was demonstrated with a decrease in CMAI scores. Agitation and aggression have made it difficult for clinicians to treat dementia patients. Hence, considering our findings, acupuncture's effect on agitation is fascinating and promising for the future. We also would like to highlight that our patient group were selected from patients with chronic musculoskeletal pain. To identify acupuncture's effect solely on agitation and aggression, a different study should be planned, to ideally include different patient groups without chronic pain and a control group as well.

To summarise our results, we showed that several geriatric problems improved after acupuncture. This includes a decrease in depressive symptoms, better cognitive functions, decreased agitation, and an increase in activities of daily living. All of these were accomplished in addition to pain management, which makes acupuncture unique for pain management in older people.

Pain, agitation, depression, and cognitive functions are all geriatric conditions arm to arm. Holistic evaluation of these would provide a better understanding and improve patient satisfaction and treatment outcomes. In patients with cognitive dysfunctions and related behavioural problems, acupuncture may even help avoid polypharmacy. Hence, we suggest that acupuncture should be used to treat chronic musculoskeletal pain in geriatric patients.

Our study has limitations as an observational study. To estimate the long-term effects, more than ten sessions of acupuncture and at least eight weeks of follow-up are required. Double-blinded randomized control trials are also a must. Such trials should be conducted to define acupuncture's impact on older people with musculoskeletal pain, and this should not be limited to pain management.

When planning further studies regarding acupuncture, pain, and agitation, we believe there must be one patient group with agitation and behavioural problems associated with pain and a control group of patients who have agitation and behavioural problems without pain. We suggest comparing CMAI scores in those two groups, which will further show whether pain relief itself or acupuncture without pain management impacts those.

Declaration of conflicting interests

The authors declare that there is no conflict of interest.

Funding

Patient consent

Both written and oral consent were obtained.

Ethical Considerations

The institutional review board approved this prospective study at Ankara Yildirim Beyazit University. The study was conducted according to the ethical standards of the Declaration of Helsinki and its later amendments. Written informed consent was obtained from all participants for the patients.

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