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Daytime sleepiness, functionality, and stress levels in chronic neck pain and effects of physical medicine and rehabilitation therapies on these situations

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ABSTRACT

OBJECTIVE: To evaluate the relationship between symptom severity, daytime sleepiness, and perceived stress levels and the impact of physical medicine & rehabilitation (PMR) therapies on these situations in chronic neck pain (CNP) conditions.

METHODS: The study included 54 patients with CNP and 20 healthy control individuals. Patients with CNP were divided into two groups: the PMR therapy group (n=34) and the CNP control group (n=20). The PMR therapy programs of the patients included TENS, hot packs, therapeutic ultrasound, and exercises. Visual analog scale (VAS) at activity and resting for neck pain, Neck Disability Index (NDI), Perceived Stress Scale (PSS), Epworth Sleepiness Scale, chin-manubrium distances (CMD), and tragus-wall distances (TWD) values were evaluated before and after the treatment programs.

RESULTS: Significant differences were found between the CNP patients and healthy controls regarding PSS, TWD, and CMD values. Furthermore, significant differences were detected between the PMR group and the CNP control group in the final evaluation of the $VAS_{resting}$, $VAS_{activity}$, PSS, and NDI levels.

CONCLUSION: Evaluation of CNP from a single point of view can leave clinically missing points. Patients with CNP should be assessed for daytime sleepiness, stress levels, and functionality, and PMR therapies can be effective in relieving pain and psychological stress in patients with CNP.

Keywords: Chronic neck pain; daytime sleepiness; functionality; rehabilitation; stress levels.

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Chronic spinal pain conditions can limit the activities of daily living, cause sleep disturbances, and increase stress levels. Chronic neck pain (CNP) can occur due to numerous reasons, including disk pathologies, degenerative changes, exercise habits, vertebrae alignment defects, and trauma [1]. It is a well-known fact that prolonged pain and disability rates in individuals with neck and back pain are high [2]. Development of chronic pain in individuals with neck and spine pain has been studied by numerous authors, and evaluation of risk for chronic spinal pain and how to approach this pain has been reported [3, 4].

Chronic spinal pain is related to the natural structure of the injury and the occupational, social, and psychological states of the patients. The relationship between chronic spinal pain and psychosocial situations has shown that psychosocial status affects the development of chronic pain, and psychosocial problems can play a role in the chronicization of spinal pain [5]. Conversely, untreated pain can result in increased levels of stress, and heavy psychological burdens may appear in this case. Additionally, sleep disturbances are associated with daytime sleepiness, which may impair personal, social, and occupational activities, leading to the need for multidisciplinary treatment in patients with CNP.

Treatment of CNP with physical agents and exercise has been performed for a long time. Superficial heaters

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can contribute to the reduction of muscle spasms [6]. Previous studies have shown that therapeutic ultrasound is effective in reducing the musculoskeletal pain conditions [7]. In addition, transcutaneous electrical stimulation (TENS) is a widely used analgesic electrical current for relieving musculoskeletal spinal pain conditions [8, 9]. Many studies have reported the positive effects of exercise therapies for decreasing pain in patients with CNP [10, 11]. The present study aims to evaluate the relationship of symptom severity, daytime sleepiness, and perceived stress levels with the short-time impact of physical medicine & rehabilitation (PMR) therapy programs in patients with CNP.

MATERIALS AND METHODS

Fifty-four patients with CNP and 20 healthy controls were included to the study. Patients with CNP were divided into two groups: the PMR therapy group (n=34) and the CNP control group (n=20). Demographic and clinical features were evaluated. Patients with history of epidural or intramuscular corticosteroid injections, pregnancy, surgery history of the spine, skin problems around the neck, benign and malignant tumors, psychiatric problems, sleep problems, and night sleep less than 6 h/day were excluded. Local ethics committee approval was obtained for the study. Informed consents were obtained from all the subjects.

The PMR therapy program included TENS, hot pack application, therapeutic ultrasound, and exercises. In total, 10 sessions were performed for 2 weeks (5 days/week). A two-channel portable machine was used for TENS applications. (BTL-4620, Czech Republic) on neck for 30 min, which delivered a premixed ampitude modulated current with 60ms pulse width and, 100 Hz frequency and intensity adjusted according to the threshold, without emerging pain or contractions for each participant. Electrodes were placed crosswise in the cervical paravertebral region. Hot packs (20 min/day) and therapeutic ultrasound (1-MHz frequency with 1 W/cm^2 intensity, for 5 min) (BTL- 4000 professional, Czech Republic) were applied. Range of motion, stretching, and strengthening (neck region muscles) exercises were given to the patients for 15 min, 5 times/week. Visual analog scale (VAS) at activity and resting for neck pain, Epworth Sleepiness Scale (ESS) [12], Perceived Stress Scale-10 (PSS) [13, 14], Neck Disability Index (NDI) [15, 16], chin-manubrium distances (mouth closed) (CMD), and tragus-wall distances (TWD) were collected at baseline and after the therapy programs. Post-treatment evaluations were performed on the first day following the end of the therapy programs. In addition, the CNP control group was evaluated twice: at baseline and 15 days after the first evaluation. Throughout the study, the patients were discouraged to use analgesics; however, they were allowed to use paracetamol daily if necessary.

Statistical analysis

Statistical analysis was conducted using SPSS for Windows, version 20.0 software program (SPSS Inc., Chicago, IL, USA). Descriptive results are shown as mean±standard deviation of continuous data or n (%) for categorical data. Baseline characteristics were compared using X^2 and student's t-tests where appropriate. Pre- and post-therapy results were evaluated through paired sample t-tests. The significant p value was evaluated as <0.05.

RESULTS

Fifty-four patients with CNP (mean age, 51.12±12.54 years) and 20 healthy controls (mean age, 51.45±7.74 years) were included in the study. Demographic and clinical features of the individuals are shown in Table 1. Significant differences were found between the CNP patients and healthy controls regarding PSS, TWD, and CMD

TABLE 1. Baseline demographic and clinical features of the CNP patients and the healthy controls

	CNP (n=54)	Healthy controls (n=20)	p
Age	51.1±12.5	51.4±7.7	>0.05
Sex M/F	13/41	5/15	>0.05
Disease duration (mo)	29.4±39.8		
Neck pain (%)	54 (100)		
Radicular pain (%)	21 (39)		
$VAS_{resting}$	6.0±2.1		
$VAS_{activity}$	7.1±1.8		
ESS	7±4.2	6.1±1.9	>0.05
NDI	56.7±12		
PSS	22.4±3.9	18.5±4.8	<0.05
TWD (cm)	11.4±2.5	8.7±1.5	<0.05
CMD (cm)	1.6±1.2	0.9±0.7	<0.05

CNP: Chronic neck pain; mo: Month; VAS: Visual analog scale; ESS: Epworth sleepiness scale; NDI: Neck disability index; PSS: Perceived stres scale; TWD: tragus-wall distance; CMD: Chin-manubrium distance.

values (Table 1). Significant improvements were detected in $VAS_{resting}$, $VAS_{activity}$, PSS, and NDI levels in the PMR group than in the control CNP group after the therapies (Table 2). Significant improvements were detected in the $VAS_{activity}$, $VAS_{resting}$, PSS, and NDI scores from baseline to post-therapy in the PMR group (Table 3).

DISCUSSION

CNP can severely limit activities of daily living as well as occupational and social activities. Especially, in the chronic period, pain may lead to sleep disorders. The prevalence of sleep disorders and daytime sleepiness is higher in patients with chronic pain conditions [17, 18]. It should be kept in mind that daytime sleepiness can lead to serious problems in workers who need attention; it may also lead to problems such as falls in elderly patients [19, 20]. Therefore, it is necessary to evaluate daytime sleepiness in pain clinics and take necessary precautions. In our study, daytime sleepiness in patients with CNP and acute effects of PMR therapies on this condition were evaluated using the ESS, which is a widely used tool in the field of sleep medicine for subjective measurement of daytime sleepiness [21]. In the present study, we did not find higher levels of daytime sleepiness in patients with CNP than in healthy controls. Furthermore, no significant improvement in the ESS scores was found after PMR therapies. Although, the relationship between daytime sleepiness and aging has been reported [22] and aging is evaluated as a risk factor for CNP, the present study did not show CNP as an independent risk factor for daytime sleepiness due to outcomes.

The relationship between chronic pain and psychosocial problems has been reported, and it has been pointed out that many psychological problems, especially depression, can coexist with chronic pain conditions [23]. Perceived stress levels of patients with chronic pain can be high, and at the same time, patients may begin to use emotional words to describe pain in these processes [24]. Perceived stress levels were significantly higher in patients with CNP than in healthy controls. This outcome indicates the vicious circle of the pain and increased stress levels in patients with CNP. The present study showed significant improvements in the perceived stress levels after the acute period of PMR therapies. This result shows that PMR therapies could be one of the beneficial components of the multidisciplinary approach for management of psychological stress in the treatment of CNP conditions.

Inter-group evaluation of the neck disability scores showed a significant difference between the PMR group

Table 2. Comparison of the demographic and clinical features of the baseline and second assessments of the PMR and control CNP groups

	PMR group (n=34)	Control CNP (n=20)	p
Age (years)	52.3±13.8	49.1±11.3	>0.05
Disease duration (months)	27.1±18.7	33.1±44.8	>0.05
ESS_{first} scores	6.9±6.1	7.1±0.8	>0.05
ESS_{second} scores	6.3±3.7	7.1±2.1	>0.05
NDI_{first} scores	58.1±12.1	54.3±4.4	>0.05
NDI_{second} scores	43±14.7	56.1±5.3	<0.05
PSS_{first} scores	23.1±3.4	21.3±1.9	>0.05
PSS_{second} scores	19±5.8	21.2±2	<0.05
CMD_{first} (cm)	1.7±1.5	1.5±0.9	>0.05
CMD_{second} (cm)	1.6±1.4	1.6±0.9	>0.05
TWD_{first} (cm)	11.8±1.6	10.9±1.4	>0.05
TWD_{second} (cm)	11.2±2	10.8±1.4	>0.05
$VAS_{activit\ y\ first}$	7.2±1.9	6.9±1.8	>0.05
$VAS_{activity\ second}$	4.7±1.7	6.3±2	<0.05
$VAS_{resting\ first}$	6.1±3.1	5.8±1.8	>0.05
$VAS_{resting\ second}$	3.9±1.8	5.1±2.1	<0.05

PMR: Physical medicine & rehabilitation; CNP: Chronic neck pain: VAS; Visual analog scale; ESS: Epworth sleepiness scale; NDI: Neck disability index; PSS: Perceived stres scale; TWD: Tragus-wall distance; CMD: chin-manubrium distance.

Table 3. Comparison of the clinical features at baseline and after PMR therapies in the PMR group

	Baseline (n=34)	After treatment (n=34)	p
ESS scores	6.9±6.1	6.3±3.7	>0.05
NDI scores	58.1±12.1	43±14.7	<0.05
PSS scores	23.1±3.4	19±5.8	<0.05
TWD (cm)	11.8±1.6	11.2±2	>0.05
CMD (cm)	1.7±1.5	1.6±1.4	>0.05
$VAS_{resting}$	6.1±3.1	3.9±1.8	<0.05
$VAS_{activity}$	7.2±1.9	4.7±1.7	<0.05

PMR: Physical medicine & rehabilitation; VAS: Visual analog scale; ESS: Epworth sleepiness scale; NDI: Neck disability index; PSS: Perceived stres scale; TWD: tragus-wall distance; CMD: Chin-manubrium distance.

and the CNP control group at the final evaluation. In addition, a significant improvement in NDI scores was detected after PMR therapies. These results indicate the negative effects of CNP on the quality of life while highlighting the short-term effectiveness of PMR therapies in replacing personal, occupational, and social functional losses due to neck pain. TWD and CMD values were measured, and no significant improvement was detected in these functional parameters after PMR therapies. This outcome can be attributed to the fact that the mean age of the participants was high, and, thus, the risk of age-related degenerative processes could be high in the study group.

Increased rates of analgesic utilization in chronic pain conditions have been reported [25]. Self-reported beliefs were detected as decreased necessity of analgesics in the individuals for whom PMR therapies were performed; however, the formal data for this result were not properly collected. Besides, this result can encourage further studies to investigate the possible effects of reducing the utilization of analgesics in PMR therapies. Conversely, a large proportion of the CNP patients reported that they chose the analgesic drugs based on their neighborhood or friends' recommendations instead of doctor recommendations, but similarly, the data were not clear for a statistical assessment. Furthermore, none of the individuals participating in the study had visited a neck & back school anytime in their life; this situation predicts the importance of neck & back schools for preventing inappropriate approaches for CNP. The present study has some limitations: Although, our sample size is small, it is acceptable compared with that of the previous studies. All the participants were enquired about the previous sleep and psychiatric disorders (especially depression); however, the data were limited as the clinical tests for these conditions were not performed (e.g., depression questionnaires). Thus, further studies with larger sample sizes and longer follow-up periods will be beneficial to evaluate the relationship of CNP with stress levels, quality of life, and daytime time sleepiness and to evaluate the short- and long-term effects of PMR therapies on these situations.

Conclusion

Evaluation of CNP from a single point of view can leave clinically missing points as patients with CNP face many problems. These patients should be assessed for daytime sleepiness, stress levels, and functionality. PMR therapies can be effective in relieving pain and psychological stress in patients with CNP.

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