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Effects of intermittent traction in patients with cervical osteoarthritis

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Abstract

Background: Osteoarthritis (OA) is the most common joint disease occuring after middle age. Because of the high mobility of the neck, OA is common in the cervical spine. The purpose of this study was to determine and compare the effects of intermittent traction on patients with mild and moderate cervical OA. Therefore, 32 patients with cervical OA were recruited.

Methods: A clinical trial study was designed for patients with cervical OA that were randomly assigned in two equal groups. Control group received a routine physical therapy protocol which included moist heat, transcutaneous electrical nerve stimulation (TENS), and an exercise for neck and shoulder girdle. Experimental group received a routine physical therapy protocol plus intermittent traction (IT).

Results: Pain and mobility improved in both groups. There was significant difference in interaction of the improvement of cervical pain between the two groups, the rate of pain reduction; sleep ease, medicine taking and range of motion (ROM) improvement in the experimental group were higher than that of the control group.

Conclusion: The results justify the efficacy of IT, therefore it can be concluded that the IT is an effective modality for patients with mild and moderate cervical OA.

Keywords: cervical mobility, intermittent traction, neck pain, numeric pain rating scale, osteoarthritis, physical therapy, range of motion.

Introduction

The osteoarthritis (OA) is the most common joint disease among all the joints of the body and one of the common physical disabilities in all nations [1, 2]. Because of high mobility in cervical column, OA is common in the neck region [3]. Approximately 50 % of all people will have one or more episodes of neck pain in the course of their life [4]. The OA has affected at least 20 million Americans, a number that is expected to double over the next two decades [5]. The majority of back and neck pain episodes disappear in a few months often with rest, analgesics, and home exercises [6]. The recurrence rate of back and neck pain is high; approximately 60% of all episodes are followed by a relapse [4, 7]. Little is known about the relevant prognostic features of neck pain. Although back and neck pains are the most common disorders of the musculoskeletal system in general practice, there is no consensus over the management of these conditions [8]. In several countries general practitioners often refer patients with back and neck pain to physical therapy, and the majority of these patients complain about persistent pain [9].

Routine physical therapy protocol of these patients includes electrical stimulation, heat and exercise therapy [10, 11, 12]. In these cases, IT is one of the possible treatment modalities [8]. The therapeutic effects of traction is based

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on sustain and reflex mechanisms [13,14]. Spinal elongations through an increase in intervertebral space and relaxation of the spinal muscles is assumed to have the most important role in the proposed mechanisms by which IT could be effective [15,16]. Cervical traction can be given in either a seated or supine position [17]. However, despite its widespread use, opinions are divergent on methods of application and clinical results [18]. The aim of this study was to verify the effectiveness of IT on patients with mild and moderate OA of the neck and to compare it with a control group.

Methods

Participants: This study was conducted as a clinical trial and performed in the physical therapy clinics of the Rehabilitation Sciences faculty of Iran Medical Sciences University and Health Services, Tehran, Iran, in Oct 2004- Jun 2006. Thirty-two male and female consecutive patients, diagnosed with mild and/or moderate cervical OA, were randomly divided into two equal groups (16 participants). In the present study patients reported a chronic and/or dull pain in the neck, and shoulder region, or a radicular pain through the upper limbs; and had a positive compression and distraction tests result. Compression and distraction force applied to cervical spine in seated position. If the test traction relieves and compression aggravates the symptoms test result was considered positive. They had at least two signs out of four radiological signs listed under inclusion criteria [10, 17]. The control group received the routine physical therapy protocol, which was included moist heat, TENS, and exercise for the neck and shoulder girdle. The exercises consisted 10 repetitions of isometric contractions of the neck flexor, extensor, and lateral flexor muscles with ten seconds hold and two times a day, and 30 repetitions of concentric contractions of scapular elevator and adductor muscles with ten seconds hold and two times a day. Treatment sessions performed three times a week in even days. The experimental group underwent the routine physical therapy protocol plus IT for 10 minutes in the first session. Traction force of approximately 10 % of the participant's body weight was applied at the onset of the treatment (pulse time was being 10s and pause time 5s). The force was increased by one kg at each 3 sessions. The maximum of force was 30 kg. Traction time increased one minute for each session so that in session 10 it was amounted to 20 minutes [19, 20]. Before treatment, in the first session, after each five treatment sessions, and two weeks after the treatment period, patients were re-evaluated and the data recorded in questionnaires. All of patients could use nonsteroidal anti-inflammatory medicine (NSAIM) based on their pain. Mechanical traction was performed in supine position, and the neck in 25 - 30 degrees of flexion. Traction applied with a BF model of Accuatrac 2 (Metron Medical Australia Pty.Ltd. 57Aster Avenue, P.O.Box 2164, Carrum Downs, Victoria, Australia). TENS applied with a SD47 model of Isotrap (Tavanbakhshnovin Pty.Ltd, #434, N Mofatteh Av P.O.Cod 15878. Tehran Iran)

The ethical committee of the university approved the study. All subjects were informed about the procedures and signed consent prior to participation.

Participant inclusion criteria

Patients with mild or moderate neck OA who referred to the physiotherapy were selected. They have at least two out of four of the following radiographic changes in the cervical region.

1 -Intervertebral disc space narrowing, 2 - Sclerosis of subchondral bone,

3 - Osteophyt formation between adjacent vertebral bodies or articular facets.

4 - The narrowing of the space between articular processes (facet joints) [10, 17].

Participant exclusion criteria

Patients with severe neck OA. Patients who did not complete a 10-sessions therapeutic peri-

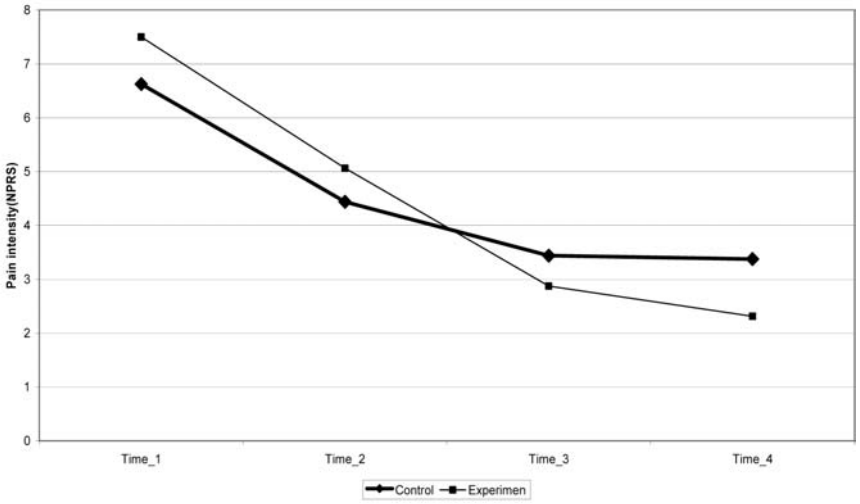

Fig.1. Interaction of pain reduction in control and experimental groups (p<0.006).

od, or follow up evaluation. And patients with neck pain by other causes (myofascial trigger points and …).

Data collection included subjects' interview, appropriate musculoskeletal evaluation, and performing cervical compression and distraction tests. Individual characteristics (age, weight and height), job, the involved side, duration of the illness, and the grade of pain, were recorded using a questionnaire. Neck range of motion (ROM) in flexion, extension, rotation to the left and the right, and the right and the left lateral flexion were measured by the standard flexible tape according to the Reese's method [21]. Pain on the neck and shoulders region, radicular pain and sleep disorder quantified according to the numeric pain rating scale (NPRS) [10, 19]. Information obtained for each patient were recorded in a questionnaire.

Statistical considerations

Data were analyzed using SPSS for windows (SPSS 10, SPSS Inc., USA).Excel and R version 2.3.1. Kolmogorov smirnov (KS) test showed no departure from normality for pain (NPRS) and neck movement (cm) data. Therefore we used the following procedures and statistical methods.

1- Repeated Measures ANOVA were used for four times of evaluation.

2- Bonferoni post hoc test was used for pair wise comparison for evaluation 1 through 4.

3- Independent t-test was used to compare dependent variables of control group with experimental group. Statistical significance for all tests was accepted 0.05 level.

Results

In the control group, the subjects' age was 64.06 ± 12.5 years, weight 68.19 ± 13.08 kg, and height 164.18 ± 9.51 cm. Mean duration of all patients' illness from onset of symptoms was 5.49 ± 4.92 years. Seven subjects were housewives and nine employees. In the experimental group, the subjects' age was 57.43 ± 7.06 years, weight 66.5 ± 14.5 kg, and height 163.5 ± 6.37 cm. Mean duration of all patients' illness from the onset of symptoms was 3.17 ± 3.8 years. Seven subjects were housewives and nine employees.

Comparing control and experimental groups, in spite of no significant mean difference for the neck pain decrease, there was significant difference in interaction of cervical pain reduction with (p< .006) [fig. 1]. There was significant difference in lateral bending of the neck to the left in 3rd evaluation with (P<0/033) and in 4th evaluation with (P<0/014). The rate of ROM in

Variable	Pain	Flexion	Extension	Rotation to the right	Rotation to the left	Lat. flexion to the right	Lat. flexion to the left	NSAID taking	Radicular pain	Sleep disorder
Control	49	7.98	15.06	3.02	5.4	15.83	23.65	74	49.87	32
Experiment	68.8	11.24	19.88	15.15	15.9	17.79	14.58	98.85	70.34	85.17

Table1. Rate of variable changes between control and experimental groups (percent).

experimental group increased more than the other. But rate of improvement approximately about all of the variables, especially rate of pain reduction, sleep disorder and NSAID taking in the experimental group were more than the control group (Table 1).

Group results for the control and experiment groups are presented in Tables 2 & 3.

Discussion

The purpose of the present study was to determine the effects of IT on patients with mild and moderate OA. Inter group results showed that there was significant interaction in pain reduction between the control and the experimental groups, and the rate of the neck pain reduction, sleep disorder, medicine taking and the increase of the neck ROM in the experimental group was more than that of the control group.

Intra group results of the study showed that there was significant statistical difference among evaluation times in the improvement of the neck and the radicular pain, increasing extension and lateral bending of the ROM in the control. To explain the positive changes in the control group, we may conclude that this improvement may be due to several factors such as 1) application of conventional TENS that modulate the pain in different ways, therefore it can reduce local neck pain and radicular pain. 2) Application of hot pack, which produces superficial moist heat, causes local and general relaxation and reduction of protective spasm, leading to pain relief. 3) Training of the neck and shoulder muscles exercises may result in the improvement of muscle performance of the neck and shoulder girdle, an increase in cervical stability, a decrease in cervical micro-trauma

Evaluation Phases	1		2		3		4	
Statistical index	Mean ± SD		Mean ± SD		Mean ± SD		Mean ± SD	
Variable	CG	EG	CG	EG	CG	EG	CG	EG
Pain	6.62±2.44	7.5±2.09	4.43 ± 2.42	5.06 ± 1.73	3.43 ± 2.73	2.87 ± 1.96	3.37 ± 2.77	2.43 ± 2.18
Flexion	9.34 ± 2.28	9.4 ± 2.92	9.94 ± 1.53	10.19 ± 2.96	10.09 ± 1.39	10.50 ± 2.77	10.15 ± 1.52	10.59 ± 2.66
Extension	6.37 ± 1.5	5.28 ± 1.39	7.12 ± 1.57	6.00 ± 1.79	7.5 ± 1.47	6.28 ± 1.79	7.49 ±1.46	6.59 ±1.9
Rotation to the right	9.94 ± 3.12	9.96 ± 1.83	10.25 ± 2.93	10.72 ± 1.50	10.47 ± 2.91	11.69 ± 1.35	10.25 ± 2.95	11.75 ± 1.43
Rotation to the left	9.81 ± 8.1	9.25 ± 2.43	9.91 ± 2.88	9.73 ± 1.43	10.25 ± 3.32	10.65 ± 1.79	10.37 ± 3.2	11.0 ± 1.89
Lat. Flex to the right	5.42 ± 1.96	6.19 ± 2.92	6.34 ± 1.93	6.31 ± 2.09	6.5 ± 1.37	7.40 ± 2.36	6.44 ± 1.75	7.53 ± 2.17
Lat. Flex to the left	4.81 ± 1.24	6.62 ± 2.15	6.06 ± 1.54	6.75 ± 1.84	6.25 ± 1.18	7.47 ± 1.84	6.31 ± 1.19	7.75 ± 1.84
Medicine taking	.7 ± 1.53	1.75 ± 2.04	.25 ± .77	.62 ± .81	.18 ± .54	.12 ± .34	.18 ± .54	.02 ± .25
Radicular pain	5.31 ± 3.34	4.62 ± 3.87	3.62 ± 2.75	2.56 ± 2.5	2.5 ± 2.55	2.0 ± 2.3	2.62 ± 2.63	1.37 ± 1.89
Sleep disorder	3.12 ± 3.96	4.18 ± 4.18	2.94 ± 3.66	1.87 ± 2.39	2.06 ± 3.06	.93 ± 1.53	2.12 ± 3.16	.62 ± 1.08

Control group= CG, Experimental group =EG

Table 2. Descriptive statistic of variables in the control and experiment groups during 4 evaluation times.

Statistical Index			Mean difference		Std. Error		Sig.[a]		95% Confidence interval for difference[b]			
									Lower bound		Upper bound	
Variable			CG	EG	CG	EG	CG	EG	CG	EG	CG	EG
Neck Pain	1	2	2.19	2.44	.45	.39	.001	.0001	.82	1.26	3.53	3.61
Neck Pain	2	3	1.19	-2.06	.38	.39	.043	.0001	.02	-3.61	2.35	-1.26
Flex	1	4	.62	-.78	.51	.19	1.00	.005	-.93	-1.35	2.18	-.21
Extension	1	4	-1.03	-1.31	.28	.39	.014	.024	-1.89	-2.49	-.18	-.14
Rot to the right	1	3	-1.06	-1.72	.33	.36	.036	.002	-2.07	-2.83	-.02	-.61
Rot to the right	2	3	-.22	.97	.35	.23	1.00	.004	-2.28	-1.65	.84	.28
Rot to the left	1	3	-1.44	-.9	.36	.18	.006	.001	-2.52	-1.46	-.36	-.34
Lat. Flex to the right	2	3	-.16	-1.09	.28	.32	1.00	.021	-1.02	-2.05	.71	-.13
Lat. Flex to the left	2	3	-.19	.72	.23	.23	1.00	.045	-.89	-1.42	.52	-.02
Medicine taking	1	3	.50	1.62	.27	.51	.53	.036	-.33	.02	1.33	3.16
Medicine taking	2	3	-.02	.5	.06	.16	1.00	.039	-.13	.02	.25	.98
Radicular pain	1	2	2.81	2.06	.68	.52	.006	.007	.73	.48	4.89	3.64
Sleep disorder	1	2	.19	2.31	.14	.61	1.00	.011	-.22	.46	.60	4.16

Control group= CG, Experimental group =EG

Table 3. Results of Bonferoni post hoc test in the control and experimental groups.

and hence pain reduction. 4) Cervical and shoulder girdle muscles exercise can facilitate local muscle circulation and reduction of total load bearing of the cervical spine, hence leading to radicular pain relief. The results were in agreement with the results of Shakoor et al. (2002) indicating positive effects of strengthening exercise on pain reduction [11].

Intra group results of the study revealed significant difference between various evaluation times of experimental group of neck pain, radicular pain and sleep disorder. To explain more positive changes in the experimental group we may assume that; IT relieves the pain because 1) IT with suitable pauses and pulls of traction load has a beneficial effect on improving metabolism of the facet joints cartilages , 2) IT improves circulation of the narrowed neural foramen, and facilitates oxygen uptake, and metabolism, thus reducing concentration of substances such as histamine, prostaglandin and so forth, 3) it helps remove adhesions occurring between the dura mater of the nerve root and bone or ligament structures of the neural foramen. Removal of the adhesions may be effective in reducing radicular pain, sleep disorder and neck pain [20, 22]. These findings are in agreement with the results of Moeti et al [19], Costantoyannis et al.[23] and Hattori et al. [24]. They reported that IT is effective for the improvement of the neck pain, especially in the radicular pain reduction.

The reduction of NSAID consumption in patients of the experimental group, in comparison to control group, could be related to the corrective and sedative effects of IT.

Neck mobility in the experimental group significantly increased in all directions i.e., flexion, extension, rotation and lateral bending to the right and the left. Movement improvement in the experiment group can be due to 1) the correction of the spinal alignment, 2) the reduction of the protective spasm, 3) distraction of the facet joints, 4) increasing the sliding between facets and 5) stretching shortened Para-spinal soft tissues, lick ligaments, and joint capsule. All these factors may facilitate segmental neck mobility increase [20, 22].

Conclusion

Although the inter groups differences were not significant, application of IT in patients with mild to moderate OA could produced a greater improvement. In the light of all these

findings we believe that in physical therapy of the patients with cervical OA, when there is not any contraindication, application of intermittent traction can be one of the best choices. We propose a new study to compare the effects of sustain traction with a control group in patients with the cervical OA.

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