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The effect of ambulatory lumbar traction combined with treadmill on patients with chronic low back pain

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Abstract. A prospective randomized study was conducted comparing vertical ambulatory traction in 41 patients (group 1) to 35 patients treated by the same traction device combined with daily walking for 12 days and than 8 more sessions on alternating days (group 2).
The pain score, lumbar spine range of motion and satisfaction with treatment were examined 1,6 and 12 months following completion of treatment. The results demonstrated improvement in pain score and range of motion at each follow up examination. The pain improvement in group 2 was significantly better than in group 1. One year after completion of treatment, 63% of the patients from group 1 and 78% of the patients from group 2 were satisfied with the results.

Keywords: Low back pain, lumbar traction, treadmill

1. Introduction

International studies have demonstrated that about 65% to 80% of the population will experience back pain at some time during their lives [7,10]. Low back pain (LBP) is expected to become a chronic problem in 5% to 10% of patients and it is estimated that at any given time, 2% of the population is disabled because of back problems [1]. The total annual costs of back pain in the United States have been estimated at $20 to $50 billion [19] despite efforts by managed care organizations to control access to health care and to contain costs [8]. The cost of LBP has continued to dominate the total cost of health care, with a preponderance of this expense consumed by chronic patients [17]. Therefore, chronic LBP must be treated optimally in order to reduce this high financial and human cost [15,17].

The management goals for those with chronic, persistent low back pain are to improve the ability to perform basic daily activities, reduce disability, and improve muscle strength [6,18,24]. These goals should be achieved in the fastest way since long periods of absence from work have been found to be associated with decreased probability for work return.

The treatment for persistent nonspecific LBP varies, but includes medication, physical therapy modalities, and exercise therapy [22]. Different physical therapy programs are often associated with vastly different implementation costs. Patient education and home-based exercise seem more cost effective [17].

It is widely recommended that patients with back pain need to be encouraged to resume normal activities as soon as possible and indeed exercise has been found to be one of the most important rehabilitation modalities [9,18,21]. Encouraging physical activity through

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an exercise program has been found effective in reducing disability and could also be preventive [16]. Activities that are combined with exercises designed to increase confidence in using the spine normally have been found to be even more effective [4].

Walking is one of the more often used excercises. It is a functional activity frequently affected in people with low back pain [23]. However, in a small patient sample it was found to improve the pain score when combined with partial body weight support [11].

In this prospective study we aimed to find out if these two commonly used treatment modalities of walking and traction when combined together are indeed efficient for this problematic medical issue of chronic back pain. Our hypothesis was that the combination of ambulatory traction and treadmill walking would increase the success rate in patients with chronic LBP.

2. Methods

Eighty four patients with chronic low back pain (LBP) were blindly randomized in this prospective study into two treatment groups. Group 1 comprised 42 patients treated with Vertical Ambulatory Traction Device (VATD) and group 2 comprised 42 patients treated with VATD combined with treadmill walking.

The inclusion criteria were patients between 18 and 65 years of age with mechanical LBP for at least six months, but less than 2 years, and degenerative discs at the lumbar spine confirmed by X-rays, magnetic resonance imaging (MRI) or computed tomography (CT) scan. Excluded were pregnant women, patients with osteoporosis or known malignancies, patients with neurologic deficit and patients who were involved in compensation or litigation actions.

The VATD (Fig. 1) was performed with the Vertetrac® Traction System (Meditrac, Tel-Aviv, Israel), a dynamic frame corset that enables both traction between the iliac crest and the ribs (with telescoping rods) and controls the amount of lordosis with a lever arm that pushes the lumbar spine from behind. The patient was able to control the amount of both traction and lordosis and was encouraged to apply traction until he felt discomfort.

Both groups of patients had daily sessions of VATD for 12 days and then 8 more sessions on alternating days. The first three sessions lasted each for 20 minutes each and the sessions that followed for 30 minutes each. After the first 3 sessions, the patients were instructed to increase the traction as tolerated. The patients in group 1 were instructed to stand or sit as tolerated while performing vertical traction. Those in group 2 were instructed to walk on a treadmill at a speed of 3 km. per hour for 15 minutes per session after the third session, for the rest 17 sessions of combined treatment.

Fig. 1. Demonstrates combination of the Vertetrac® Traction System and the treadmill.

The patients were evaluated before initiation of treatment, 1 month, 6 months and 1 year following completion of the treatment program. At each follow up examination, neurologic status was evaluated and the range of foreword bending of the lumbar spine was indirectly measured by the distance reached with the fingertips at the point of maximum foreword bending. If, at the end of foreword bending the patient reached his ankles or below, he was graded as Grade 0. If he reached the distal half of his legs with his fingertips he was graded as Grade 1, up to the proximal half of the legs as Grade 2, the distal half of the thighs as Grade 3 and without any flexion or up to the proximal half of

the thighs as Grade 4. At each meeting the degree of pain was also recorded using the Visual Analog Scale (VAS) from 0 (no-pain) to 10 (maximum pain). The overall satisfaction with treatment was recorded at the last follow up.

The patients were asked to rank the treatment modality as "very effective", "effective", "cannot decide" and as "not effective".

The difference between and within the groups was statistically analyzed. The Pearson Chi-Square test was used for differences in satisfaction rate between the groups. The T Test was used for differences in pain and range of motion between the groups before initiation of treatment and also for differences in age, sex and duration of pain between the groups. The ANOVA test with repeated measures between subjects was used for differences between the groups and within subjects for the influence of time on the results in respect to pain and range of motion.

3. Results

Only 76 out of the 84 patients recruited completed the study. Five (4 from Group 2 and 1 from group 1) were unable to adhere to the treatment program and 3 from Group 2 were lost to follow up. There were 23 males and 18 females in Group 1 and 19 males and 16 females in Group 2 (No statistical significant difference). The mean age of the patients was 49.2 and 48.6 years in Groups 1 and 2, respectively (No statistical significant difference). The average duration of back pain before the ambulatory traction started was 11.8 and 11.2 months on average (No statistical significant difference).

No major adverse effects were recorded in any of the patients in either group. No neurologic deficit was found in any of the patients throughout the study period. Two patients from Group 2 reported having "tired legs" lasting for up to 15 minutes at the end of the treadmill training. Three patients (2 from Group 2 and 1 from Group 1) informed of a transient tingling sensation at the thighs that was relieved with some release of the traction. Apart from the 5 patients excluded from the study who were unable to adhere to the research program because it increased their back pain, none of the patients in either group reported that the treatment had increased their back pain.

The pain scores at each meeting in both groups are presented in Fig. 2 and the variations of the range of motion are presented in Fig. 3. Both groups were similar in respect to range of motion and pain intensity before initiation of treatment (No statistical significant difference between the groups). In both groups, treatment significantly improved the range of motion and decreased the pain intensity. At each follow up examination the pain intensity was less and the range of motion better in group 2 compared to Group 1 but the differences were statistically significant only for pain ($P < 0.001$). Table 1 presents patient satisfaction with treatment at the end of follow up, 1 year after completion of the treatment. It can be seen from the table that 63% and 78% of the patients from Group 1 and Group 2 respectively were satisfied with the results, a difference that was not found statistically significant ($p = 0.972$).

Table 1
The patient's satisfaction rates in both groups as recorded one year following completion of treatment

	Group 1*	Group 2*
Very efficient	10 (24%)	11 (32%)
Efficient	16 (39%)	16 (46%)
Can't decide	8 (20%)	4 (11%)
Not efficient	7 (17%)	4 (11%)

*No statistical significant difference between groups; Pearson Chi-Sqare = 0.972.

4. Discussion

Chronic LBP is a multifactorial problem that must be managed with a multidisciplinary approach addressing physical and socioeconomic aspects of the illness. Lumbar traction is one of the oldest and most commonly used methods of treatment for patients with LBP and has been found to be beneficial in patients with LBP [22]. The mechanism by which traction is supposed to relieve back pain is not clear. It seems that by separating the vertebrae, pressure is removed from injured tissues, muscle spasm is reduced and peripheral circulation is increased possibly by a massage effect [14]. In some studies traction has been found beneficial in patients with LBP and disc herniation [21], but recent medical literature and randomized controlled trials have provided evidence that conventional traction is ineffective for patients with LBP [3,4,10,13,20,21]. The difference between these reports may be explained by the differences in the diagnostic categories of LBP, available traction techniques, and methodology [4,13, 20]. In contrast to these studies both groups of patients in our study were similar with respect to age, sex and duration of symptoms.

Only patients with lumbar disc degeneration confirmed by X-ray, MRI or CT scan were included and

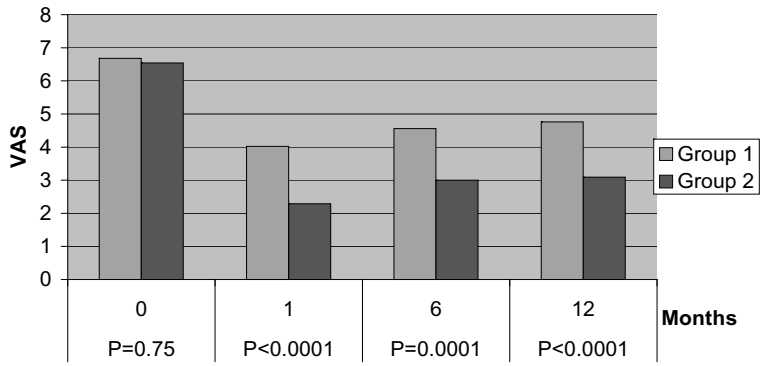

Fig. 2. Pain intensity according to the Visual Analog Scale (VAS) and statistical significance in both treatments groups, before and up to one year following completion of treatment.

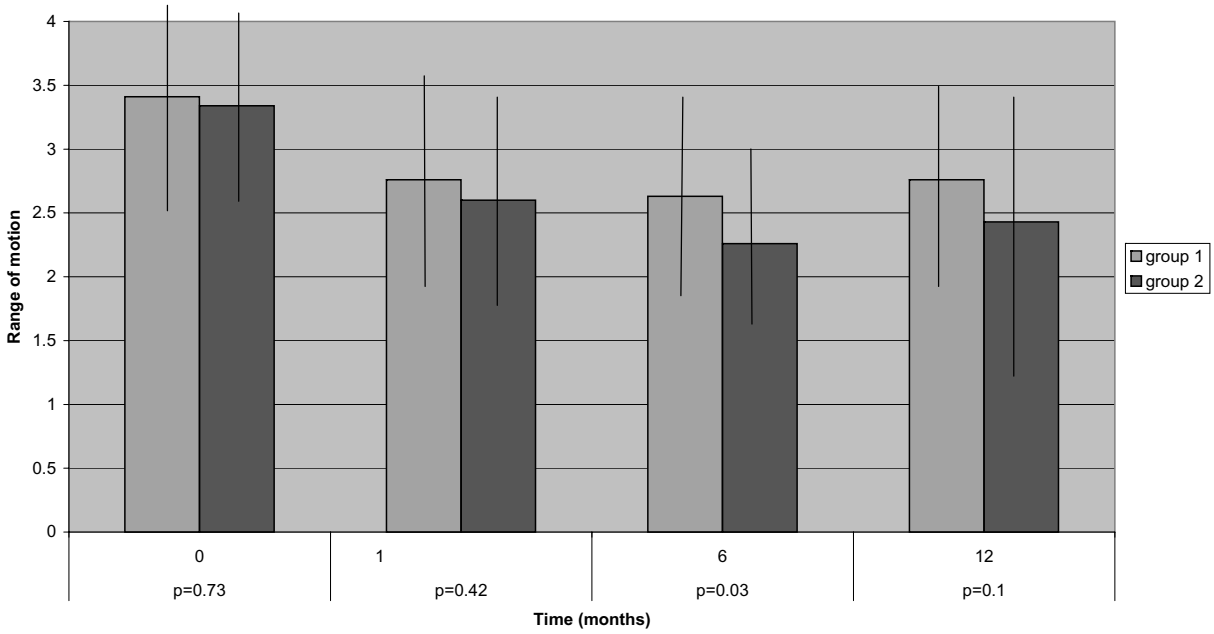

Fig. 3. The range of foreward bending from 0 (no limitation) to 4 (no motion) and the statistical significance between the treatment groups, before and up to one year following completion of treatment.

the traction method used was the same in all of them. Exercise has been reported to be beneficial in the treatment of patients with chronic LBP [9,21]. When combined with an active program of exercise and education, traction has been found to promote functional restoration [25].

Treadmill walking is one of the most commonly used exercise modalities. It provides self-controlled constant and recurrent activity and has been found to be the best test for measuring aerobic fitness levels in patients with chronic LBP [26]. On the other hand, it might provoke pain. For some patients, limiting physical activity may be a self-protective measure as they may actually experience a significant increase in pain intensity with physical activities, as in 4 patients from Group 2 who were excluded from our study following aggravation of back pain while walking on the treadmill. In a study conducted by Taylor et al., 10 minutes of treadmill walking at a self-selected speed led to a reduction in the level of pain in patients with acute low back pain [23]. When combined with partial body weight support, treadmill walking showed sufficient promise for pain relief and functional improvement. The authors found justifiable to test the efficacy of this treatment method in larger groups of subjects with back pain [11] and we took on the challenge.

The hypothesis of our study that, if combined with traction, treadmill walking would increase the success rate in patients with chronic LBP was found to be correct. Patients who were treated by ambulatory traction combined with treadmill walking had significantly better pain relief than those treated by traction alone. There was an improvement in pain intensity and also in patient self-assessment of the results. Seventy eight percent of the patients treated with ambulatory vertical traction and treadmill walking were satisfied compared to 63% of the patients treated by ambulatory traction. As might expected, some gradual loss of the immediate good results was noted with time in both groups but was found to remain almost unchanged 6 months after application of the last treatment. One year following completion of the treatment program both groups of patients had less pain than at the beginning of treatment, but those treated with treadmill walking were still significantly better. Less significant was the improvement in the range of motion of the lumbar spine in both groups following treatment.

In this study, we measured forward bending by estimating the distance of the fingertips at the point of maximum forward bending. We aware of the fact that this measuring method include the range of motion of the hip joint, but it sufficed for this study since we were more interested in differences between the groups than in the true range of motion of the lumbar spine, Many factors might influence spine mobility. Some of them are organic factors that include different severity of facet or disc degeneration and others are psychosocial, or environmental factors including fear that excessive motion will initiate pain [12]. These factors were not addressed in this study. Some previous studies demonstrated that reduced spine motion in subjects with previous LBP was associated with an increased risk of recurrence [5], but other studies did not find spine flexibility to be associated with either recovery from or severity of LBP [2]. We can conclude that traction combined with treadmill walking is effective in the treatment of patients with chronic LBP. Wheter it is also effective with other methods of exercise should be examined in further prospective studies.

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