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Lumbar Traction in the Management of Low Back Pain: A Survey of Latest Results

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Abstract

Introduction : Low back pain (LBP) is one of the most common complaints in the general population, affecting about 70-80% of the population at some point in life. LBP management comprises a wide range of different intervention strategies. One of the treatment options is traction therapy. The aim of our short review is to summarize and analyze the latest result reporting the use of lumbar traction in LBP treatment in order to evaluate the real effectiveness and indications of this specific physical therapy.

Materials and methods: A comprehensive search of PubMed, Medline, Cochrane, Embase, and Google Scholar databases was performed, covering the period between 2006 and 2013. 54 citations were obtained. Relevant data from each included study were extracted and recorded.

Results: A total of 14 studies were included in the review. Among these 14 studies, 11 were randomized clinical trials, 1 was a retrospective cohort study and 2 were case series. The majority of included studies used traction on patients that suffered nerve root compression symptoms. The mean number of traction sessions was 19. At most, the duration of each session was 30 min (range 3-30 min). The mean period of traction treatment was 6 weeks (range 3-12 weeks). 11 studies coupled with traction other therapies. Only 3 studies used traction as a single treatment. The mean follow up period was 16,5 weeks from the end of treatment.

Conclusion: Several biases can be introduced by limited quality evidence from the included studies. Lumbar traction seems to produce positive results in nerve root compression symptoms. Data in degenerative and discogenic pain are debatable. To date, the use of lumbar traction therapy alone in LBP management is not recommended by the best available evidence.

Keywords: Lumbar traction; Low back pain; Lumbar disc herniation; Lumbar disc disease; LBP; Physical therapy.

Introduction

Low back pain (LBP) is one of the most common complaints in the general population, affecting about 70-80% of the population at some point in life [1,2]. Moreover, LBP is a common cause of disability and work loss in developed countries, creating a large social and economic burden on society [3]. When we talk about low back pain, we have to deal with a great variety of clinical situations including acute, subacute(4 to 12 weeks) or chronic LBP. Furthermore, LBP can be due to several spine or "extra-spinal" diseases as nerve root compression, discogenic pain, rheumatologic or hip-related problems. The management of these conditions, that have to be clearly distinguished, comprises a wide range of different intervention strategies including surgery, drug therapy (NSAID's, corticosteroids, opioid) and non-medical interventions (rest, physical therapy, ozone therapy). There are numerous clinical guidelines on LBP produced worldwide, yet lack of consensus about effectiveness [4,5]. Physiotherapy (PT) interventions for the management of LBP are wide and variable, but the efficacy of many is still questionable [6,7]. One of the treatment options is traction, which may be applied in many forms: motorized lumbar traction (traction applied by a motorized pulley), autotraction (the patient exerts the traction force through a pulling or pushing action), gravitational traction (traction through a suspension device), or manual traction (forces exerted by the therapist). The supposed mechanical effects of traction are vertebral separation and widening of intervertebral foramen in order to relieve pain and recover joint function by reducing pressure on discs or nerves [8-11]. Despite a huge number of systematic reviews regarding its efficacy in lumbar pain management [11-19], the evidence of traction use is still unclear. On the contrary, many surveys have shown its continued use: with 7% of the LBP patients in the Republic of Ireland and the UK [20], with 13.7% in Northern Ireland [21], 7% in the Netherlands[22,5] 21% in the United States [23], and up to 30% of patients with acute LBP and sciatica in Canada [24]. The aim of our short review is to summarize and analyze the latest result reporting the use of lumbar traction in LBP treatment in order to evaluate the real effectiveness and indications of this specific physical therapy.

Materials and Methods

A comprehensive search of PubMed, Medline, Cochrane, Embase, and Google Scholar databases was performed, covering the period between 2006 and 2013. We used various combinations of the following keywords: "lumbar traction," " low back pain," "lumbar disc herniation," "lumbar disc disease," "LBP," and "physical therapy."

Each reference list from the identified articles was manually checked to verify that relevant articles were not missed. A total of 54 citations were obtained. The non–English-language studies were excluded. Biomechanical, cadaveric and preclinical studies were excluded as well. Reviews, case reports or case series reporting less than 20 cases were excluded. Flow diagram illustrates the number of studies that have been identified, included, and excluded and the reasons for exclusion (Figure 1). Further, each included study was evaluated for the following variables: study type, number of patients, type of LBP, traction mode, duration and frequency of sessions, traction position, weight applied, associated therapy and duration of follow up after treatment. Relevant data from each included study were extracted and recorded.

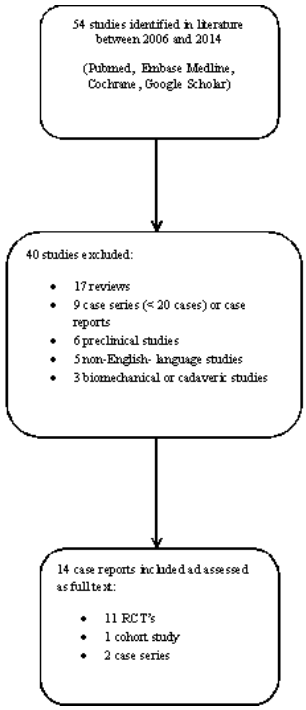

Figure 1: Flow diagram, depicting the number of studies identified, included, and excluded as well as the reasons for exclusion.

Results

A total of 14 studies published from 2006 to 2013 that reported clinical or radiological outcomes of lumbar traction treatment in LBP were finally included in the review. Among these 14 studies, 11 were randomized clinical trials [11,24-33], 1 was a retrospective cohort study [34] and 2 were case series [35,36]. The total number of patients included in our review is 1104. 12 studies were related specifically to nerve root compression symptoms [24-28,30,31,33-36], 6 took into account degenerative disc disease, mechanic pain, hypolordosis or generic "chronic low back pain" alone or in association with nerve root compression symptoms [11,25,29,32,33,35]. In 12 studies, motorized traction was used [11,24,26-30,32-36] when in 1 RTC manual traction was the declared physical therapy [25]. Inversion therapy was used only in one study [31]. In 8 studies, the preferred traction position was supine [11,27-29,32-34,36]. Patients were treated prone in 3 studies [26,30,35]. 1 prone vs supine position study was found in literature [25]. 1 RCT don't declare the traction position [24]. The mean number of traction sessions was 19. At most, the duration of each session was 30 min (range 3-30 min). In almost all studies the duration of each session increased along with the number of session. The mean period of traction treatment was 6 weeks (range 3-12 weeks). The weight applied for traction was in a range between 5 kg and 60% of the body weight. Only 1 study increased the traction weight till patient's tolerance [36]. Normally, traction weight increased along with the number of traction session. 11 studies coupled with traction other therapies (physiotherapy, manual therapy, US, hotpack, TENS, massage) [11,24-27,29-33,36]. Only 3 studies used traction as a single therapy [28,34,35]. The mean follow up period was 16,5 weeks from the end of treatment. Only 1 work evaluated patients at the end of treatment [34]. All included studies and their main features are resumed in Table 1.

Discussion

Acute and chronic LBP are complex disorders that must be managed with a multidisciplinary approach addressing physical and socioeconomic aspects of the illness. Medication and physical therapy methods including traction have proven to be useful adjuncts to an active program of exercise and education that promotes functional restoration [37].

No of study	Author	Year	Study design	No. of patients	Type of LBP	Traction mode	Duration and frequency of treatment	Trac-tion po-csition	Traction weight	Traction-associ-ated therapy	Last F.U. (weeks)
1	Ozturk et al. [24]	2006	RCT	46	Disc herniation	motorized	15 sessions of 15 min/3 weeks	not specified	25-50% of the body weight	Hotpack+US +diadynamic currents US+diadynamic currents	3
2	Beyki et al. [25]	2007	RCT	124	Degenerative/ disc herniation	manual	10 sessions/4 weeks	prone vs supine	35-50% of the body weight	Hotpack+TENS	6
3	Fritz et al. [26]	2007	RCT	64	Nerve root compression	motorized	12 sessions of 12 min/6 weeks	prone	40-60% of the	Extension-oriented treatment approach	6

									body weight		
4	Harte et al. [43]	2007	RCT	30	Nerve root compression	motorized	2-3 sessions per week of 10-20 min/ 4-6 weeks	supine	5-60 kg	Manual therapy+ exercise+advice	24
5	Apfel et al. [34]	2008	Retrospective cohort study	30	Discogenic/ disc herniation	motorized	22 sessions of 28 min/ 6 weeks	supine	4,5 kg less-9,07 more of 50% of the body weight	-	after treatment
6	Beattie et al. [35]	2008	Case series	296	Degenerative/ disc herniation	motorized	28 sessions of 30 min/8 weeks	prone	Not cleared	-	25
7	Unlu et al. [28]	2008	RCT	60 (3 groups of 20 patient)	Acute leg pain/ disc herniation	motorized	15 sessions/3 weeks	supine	35-50% of the body weight	-	12
8	Schimmel et al. [29]	2009	RCT	60	Chronic LBP	motorized	20 sessions of 25-30 min/ 6 weeks	supine	4,5 less-4,5 more of 50% of the body weight	Massage+heat+music	14 weeks
9	Kamanli et al. [36]	2010	Case series	26	Disc herniation	not specified	15 sessions of 10 min/3 weeks	supine	1/3 of the body weight-tolerance	Hotpack+US+TENS	6/4/2014 weeks
10	Fritz et al. [30]	2010	RCT	120	Nerve root compression	Motorized	12 session of 12 min/6 week	prone	40-60% of the body weight	Extension-oriented treatment approach Stretching	2/21/1900
11	Diab et al. [11]	2012	RCT	80	Chronic LBP	(lumbar extension traction)	30 sessions of 3-20 min-10 weeks	supine	not specified	exercise+infrared radiation	1/24/1900
12	Prasad et al. [31]	2012	RCT	24	Discogenic	inversion therapy	12 sessions/ 4 weeks	-	-	Physiotherapy	1/6/1900
13	Diab et al. [32]	2013	RCT	80	Chronic mechanical LBP hypolordosis	motorized (lumbar extension traction)	36 session of 3-20 min/ 12 weeks (average)	supine	not specified	Stretchingexercises +infrared radiation	1/12/1900
14	Moustafa et al. [33]	2013	RCT	64	L5-S1 disc herniation/ hypolordosis	motorized (lumbar extension traction)	30 sessions of 3-20 min-10 weeks	supine	not specified	Hot packs+interferential therapy	1/24/1900

Table 1: Summary of studies included and main features

Traction mechanism to relieve pain seems to separate the vertebrae, remove pressure or contact forces from injured tissue, increase peripheral circulation by a massage effect, and reduce muscle spasm [38]. The results of previous studies examining the efficacy of lumbar traction yielded conflicting results [6,39-41]. The aim of this short review is to discuss and analyze the latest result regarding lumbar traction in order to clarify some aspects of this specific and useful physical therapy.

The majority of included studies employed traction on patients that suffered nerve root compression symptoms (radiculopathy, sciatica, discogenic pain). Mustafa, in his randomized clinical trial, aims to investigate the effects of lumbar extension traction in patients with unilateral lumbosacral radiculopathy due to L5-S1 disc herniation. All patients has also hypolordotic lumbar spine (<39°). The control group received hot packs and interferential therapy, whereas the traction group received lumbar extension traction in addition to hot packs and interferential therapy. He concluded that traction group had better

effects than the control one with regard to pain, disability, H-reflex parameters and segmental intervertebral movements [33]. Fritz et al. performed a RCT in order to identify a subgroup of patients with low back pain who are likely to respond favorably to an intervention including mechanical traction. The results of this study suggest this subgroup is characterized by the presence of leg symptoms, signs of nerve root compression, and either peripheralization with extension movements or a crossed straight leg raise [26]. Some years later, the same author conducted a preliminary study on 120 patients examining the effectiveness of a treatment protocol of mechanical traction with extension-oriented activities for patients with low back pain and signs of nerve root irritation. The authors proved that add traction to extension-oriented activities lead to a better clinical outcome. Moreover, they examine a validity of a subgrouping method based on the presence peripheralization of symptoms with extension movement and/or a positive crossed straight leg raise test. This screening will allows the identification of patients who could take advantage from traction therapy [30].

The use of mechanical traction in the management of patients with chronic low back pain/degenerative spine disorders has generally not been endorsed by evidence-based practice guidelines. Diab et al. aim to investigate the effects of lumbar extension traction with stretching and infrared radiation compared with stretching and infrared radiation alone on the lumbar curve, pain, and intervertebral movements of 80 patients with chronic mechanical low back pain (CMLBP). They stated that lumbar extension traction with stretching exercises and infrared radiation was statistically superior to stretching exercises and infrared radiation alone for improving the sagittal lumbar curve, pain, and intervertebral movement in CMLBP [11]. Beyki et al. compared the outcomes of prone and supine lumbar traction in patients with chronic discogenic low back pain. They noted that prone traction was associated with improvements in pain intensity and ODI scores at discharge but they cannot imply a long lasting relationship between the traction and outcomes [25].

Some studies tried to investigate the radiological (MRI or CT) outcome of lumbar traction therapy along with clinical ones. Unlu et al. compared the outcome of traction, ultrasound, and low-power laser (LPL) therapies by using magnetic resonance imaging and clinical parameters in patients with nerve root compression symptoms. 60 patients were randomly assigned into 1 of 3 groups equally according to the therapies applied. There were significant reductions in pain and disability scores between baseline and follow-up periods, but there was not a significant difference between the 3 treatment groups at any of the 4 interview times. There were significant reductions of size of the herniated mass on magnetic resonance imaging immediately after treatment, but no differences between groups [28]. Kamanli et al. measured the outcome of conservative physical therapy with traction, by using magnetic resonance imaging and clinical parameters in patients presenting with low back pain caused by lumbar disc herniation. Magnetic resonance imaging examinations were carried out before and 4-6 weeks after the treatment. There were significant improvement in clinical outcomes and significant increases in lumbar movements between baseline and follow-up periods. There were significant reductions of size of the herniated mass in five patients, and significant increase in 3 patients on magnetic resonance imaging after treatment, but no differences in other patients. These results suggest that clinical improvement is not correlated with the finding of MRI. Patients with lumbar disc herniation should be monitored clinically [36]. In 2006, Ozturk et al. investigated the effects of continuous lumbar traction in patients with lumbar disc herniation on clinical findings, and size of the herniated disc measured by computed tomography (CT). 46 patients with lumbar disc herniation were included, and randomized into two groups as the traction group (24 patients), and the control group (22 patients). The traction group was given a physical therapy program and continuous lumbar traction. The control group was given the same physical therapy program without traction, for the same duration of time. They achieved statistically relevant improvement in their reults concluding that lumbar traction is both effective in improving symptoms and clinical findings in patients with lumbar disc herniation and also in decreasing the size of the herniated disc material as measured by CT [24]. The goal of the study carried out by Apfel et al. was to determine if changes in LBP, as measured on a verbal rating scale, before and after a 6-week treatment period with non-surgical spinal decompression, correlate with changes in lumbar disc height, as measured on computed tomography (CT) scans. 30 patients were enrolled for this study. The concluded that non-surgical spinal decompression was associated with a reduction in pain and an increase in disc height. The correlation of these variables suggests that pain reduction may be mediated, at least in part, through a restoration of disc height. Nevertheless, authors stated that randomized controlled trials is needed to confirm these promising results [34].

The possibility of lumbar sagittal curve correction with 2 way lumbar traction has been described in literature [12]. In 2013, Diab et al. conducted an RCT to investigate the effect of extension on the , function and whole spine sagittal balance as represented in curvature, thoracic curvature, C7 plumb line, and sacral slope. Eighty patients with chronic mechanical (CMLBP) and definite hypolordosis were randomly assigned to or a control group. The control group (n=40) received stretching exercises and infrared radiation, whereas the traction group (n=40) received lumbar extension traction in addition to stretching exercises and infrared radiation three times a week for 10 weeks. They stated l extension in addition to stretching exercises and infrared radiation improved the spine sagittal balance parameters and decreased the and disability in chronic mechanical LBP.

In lumbar traction therapy, several factors has to be considered [32]. Among other (weight, number and duration of sessions, duration of treatment) the position of traction is of a paramount importance. No univocal results can be drawn from literature. 8 studies included in our review used supine traction position. According to these findings, the majority of studies found in literature employed supine position for traction therapy. Beattie et al. aim to determine outcomes after administration of a prone lumbar traction protocol in 296 consecutive patients with LBP and evidence of a degenerative and/or herniated intervertebral disk. Traction applied in the prone position for 8 weeks was associated with clinical improvements till the end of follow up (180 days after discharge). Obviously, causal relationships between these outcomes and the intervention should not be made until further study is performed using randomized comparison groups [35]. Only 1 study compared the efficacy of prone and supine lumbar traction. Beyki et al. performed a 4-week course of lumbar traction, prone or supine, in 124 patients randomly divided in case and control groups. Case group (prone traction) had statistically better clinical results compared to control group (supine traction) [25].

Separate mention has to be done for inversion therapy. In “Inversion” or “Backswing”, a tilt table is used and the weight of the entire upper half of the patient’s body assisted by gravity acts as the traction [42]. The traction forces here are likely to be more consistent and tailored to each patient than conventional traction. In our review,

we detected only 1 study concerning inversion therapy. It was a prospective randomized controlled trial. 24 patients awaiting surgery for pure lumbar discogenic disease were allocated to either physiotherapy or physiotherapy and intermittent traction with an inversion device. Authors concluded that the association of inversion traction and physiotherapy resulted in a significant reduction in the need for surgery. Along with several supposed benefits, traction therapy has some adverse effects. These effects were in the main not of a serious nature (short-term exacerbation of symptoms, pain on release of traction, headache, difficulty relaxing). In contrast, episodes of cauda equina symptoms and hospitalization because of acute onset of pain are rare but possible complications [43,44].

This short review has several limitations. First of all, we included only English-language studies. Several biases can be introduced by quality of studies. Most of them were RCTs but in many cases authors don't cleared the randomization protocol. Most of these studies enrolled few patients. In consequence, clear statistical results cannot be drawn. Follow up periods were too short. Lastly, the majority of included papers associated other therapies (physiotherapy, TENS, massage, US) to lumbar traction. This consideration created an heavy bias on the evaluation of traction benefits.

Conclusion

To conclude, we identified 14 studies (11 RCTs, 1 retrospective cohort study and 2 were case series) that evaluated lumbar traction effects for patients with acute or chronic non-specific LBP. Lumbar traction seems to produce positive results in nerve root compression symptoms. Data in degenerative and discogenic pain are debatable. A subgroup of patients with low back pain (peripheralization of symptoms with extension movement and/or a positive crossed straight leg raise test) may exist for whom mechanical traction is an effective treatment. Nevertheless, the limited quality evidence from the included studies show very small effects that are not clinically relevant. The majority of included studies applied lumbar traction in association with other therapies. Therefore, authors cannot draw definite clinical result. In summary, to date the use of lumbar traction therapy alone in LBP management is not recommended by the best available evidence. For future research the focus should be on high-quality RCTs with sufficient sample size to be able to draw firm conclusions.

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