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Herniated lumbar disc treated with Global Postural Reeducation. A middle-term evaluation

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Abstract. – BACKGROUND, Herniated lumbar intervertebral disc (HLID) is a pathological condition frequently seen in rehabilitation medicine that is characterized by the compression of one or more nerve roots.

AIM, The aim of this study was to describe the effects of Global Postural Reeducation on function and pain in patients with herniated disc at levels L4-L5 and/or L5-S1.

MATERIALS AND METHODS, Twenty-four consecutive subjects were treated with Global Postural Reeducation. Before treatment, patients reported median average pain duration of 180 days. At the beginning of treatment and on days 15, 45, 120, and 180, all completed the Quebec Back Pain Disability Scale and the Numeric Pain Rating Scale.

RESULTS, The median value of the Quebec Back Pain Disability Scale score decreased from 49 points at baseline to 22 points at 90 days. Moreover, the median Numeric Pain Rating Scale score decreased from 6 points at baseline to 2 points at 45 days.

CONCLUSIONS, The present study indicates that Global Postural Reeducation is suitable for the conservative management of HLID. Moreover, patients gained a therapeutic benefit from being active participants in their recovery.

Key Words:
Applied kinesiology, Low back pain, Muscle stretching exercises, Pain measurement.

Introduction

Herniated lumbar intervertebral disc (HLID) is a pathological condition frequently seen in rehabilitation medicine that is characterized by the compression of one or more nerve roots. Gluteal and/or unilateral radicular leg pain are present in people with HLID, depending on the roots involved[1]. Reduction in lumbar tract motion and loss of leg muscle strength are also likely to be present. Conservative and surgical management of this condition are widely discussed in the literature. Saal and Saal[2] reported good results using physiotherapy treatment in a series of patients with HLID. Although natural regression of the lumbar herniation has been observed in some cases[3-5], a 17-year follow-up study of people with herniated discs showed a risk of an increase in the number of herniated discs over time[6]. HLID can be treated without surgery if the patient is able to tolerate the symptoms for the first two months[7]. A wide variety of conservative treatments are available[8]. If each vertebra is compared to a lever of 1° where the interapophyseal articulations are the point of support, the role of the intervertebral disc is that of a direct and passive cushion for the axial compressions. Furthermore, the disc plays a role in stabilizing the spinal column by creating a link between the anterior and posterior longitudinal ligaments at every level. The anatomical structure of the disc allows it to work with the spinal column ligaments to limit vertebral movement. The specific physical load generated by erect and sitting postures in daily routines plays a more significant role in disc degeneration than do loads resulting from work and sports[9]. Keagan[10] reported that patients with lumbosciatic neuralgia caused by a herniated disc in the lumbosacral tract have reported significant difficulty in straightening their backs, and they experience pain when getting up from the sitting position, particularly after having been seated for a long period of time. The physical discomfort produced by disc degeneration[11] and prolonged sitting[12,13] is heightened by psychological factors that arise in response to prolonged painful activity. In cases of

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suspected HLID, a detailed differential diagnosis is necessary to exclude the presence of piriformis syndrome[14-16] or dysfunction of the sacroiliac joints that could be associated with undiagnosed lower limb and gluteal region pain[17,18]. Clinical examination and imaging techniques such as magnetic resonance imaging (MRI) are valid diagnostic tools for HLID[13,19-21]. Previous studies have reported a relatively short-term advantage of surgical treatment in patients with radiculopathy caused by HLID[22]. However, a recent systematic review found no significant difference in recovery between prolonged conservative therapy and surgery in 95% of patients during the first year after surgery[23]. Nevertheless, physiotherapists must evaluate the functional efficacy of conservative treatment taking into consideration the clinical risk of the therapy. A HLID rehabilitation program must focus on the management of pain and improvement of function. A common complaint of patients with HLID is the inability to sit for long periods of time, and this condition is influenced by postural dynamics and individual motor schemes[24,25]. Several studies have investigated the global position of the spine while driving and while maintaining a sitting position in general[26,27]. Endo et al[28] reported that the sagittal spinal alignment in patients with a lumbar herniated disc showed more anterior translation of the plumb line (C7-inferior lumbar lordosis) and a more vertical sacrum compared with healthy volunteers. The principal function of the spinal column and the muscular and ligamentous structures is to guarantee stability and flexibility, even in unfavorable biomechanical positions. In a radiographic study carried out in 109 patients with low back pain, Lord et al[29] found a decrease in lumbar lordosis in the sitting position compared with the standing-upright position. The decrease was more evident in the lower segment of the spinal column from L4 to S1. These data may be explained, in part, by the increase in pain while in the sitting position in patients with a lumbar herniated disc at the level of L4-L5 and/or L5-S1. Reduction of lordosis by shifting the point of support forward increases compression of the disc and causes lower back pain. The decrease in the lordotic curve is further accentuated by retraction of the pelvis-trochanteric and ischiocrural muscles. These findings suggest that patients with HLID must re-equilibrate muscle tensions. The aim of the present study was to describe the effects of the GPR method on function and pain in patients with herniated disc at levels L4-L5 and/or L5-S1.

Materials and Methods

We conduct a prospective study in a series of consecutive patients treated with GPR therapy between December 2009 and November 2010 in a rehabilitation center in Bologna, Italy. Twenty-four patients with HLID at the level of L4-L5, L5-S1, or L4-L5+L5-S1 were observed (Table I). All subjects provided informed consent before participating in the study. Diagnosis was made using MRI and clinical criteria (muscle wasting, impaired reflexes, sensory deficits, gluteal-leg pain, lumbar range of motion impairment, and pain during forward flexion). They were referred by orthopedic surgeons, neurosurgeons and physiatrists who initially have diagnosed the pathological condition. Before treatment, patients reported median average pain duration of 180 days. At baseline (Table I), 19 of 24 (79%) patients had participated in at least one physical activity regularly, and 37% of those participated in swimming. Patients reported being in the sitting position for a median time of 8 h (range, 5-12.5 h) daily. At the beginning of treatment (T1) and on days 15 (T2), 45 (T3), 120 (T4), and 180

Table I. Characteristics of patients (n = 24).

	Mean (min-max)
Variable	
Age (years)	43.9 ± 14.5 (22-76)
BMI (kg/m^2)	24.1 ± 4.2 (18.1-32.8)
	Median (min-max)
Duration of symptoms (days)	180 (45-2000)
L_4-L_5	302.5 (240-365)
L_5-S_1	150 (45-365)
L_4-L_5 + L_5-S_1	240 (80-2000)
Daily sitting (hours)	8 (5-12.5)
	N – (%)
Sex	
Female	17 – (71%)
Male	7 – (29%)
Herniated disk level	
L_4-L_5	2 – (8%)
L_5-S_1	15 – (63%)
L_4-L_5 + L_5-S_1	7 – (29%)
Sport activities	
Yes	19 – (79%)
No	5 – (21%)
Number of sport activities	
1	10 – (53%)
2	6 – (32%)
3 or more	3 – (16%)

(T5), all patients completed the Quebec Back Pain Disability Scale (QBPDS), which consists of 20 items with a total score range of 0-100 points, and the Numeric Pain Rating Scale (NPRS), with a total range of 0-10 points[30-32]. Each patient kept a daily diary to monitor number of hours in the sitting position during the first 15 days, beginning on the day treatment commenced. The GPR treatment was concluded at T5 in all subjects.

Procedure: reeducation treatment in patients with HLID is complex and aims to actively involve patient. GPR is a method developed by Souchard[33] who proposed using therapeutic postures to elongate, re-equilibrate, and restore function to muscles, particularly static muscles, by means of a global active workout[34]. The GPR approach in a series of patients with low back pain is described in detail elsewhere[35]. The technique in the present study was standardized by limiting therapy to two postures and their combinations. All therapeutic sessions were carried out individually and lasted 50-60 minutes once or twice weekly during the first 45 days of the study. A median of eight therapeutic sessions (range, 6-9) were conducted in each patient. After this period, subjects received a median of seven therapeutic sessions (range, 6-10) until the end of treatment at 180 days. Two therapeutic postures were used in each session. In the first, patient lay in the supine position with hips flexed, abducted, and externally rotated with the soles of the feet touching. The physiotherapist then applied axial traction to the sacrum and the occiput to permit realignment of the cervical and lumbar tract in association with maximum articular decompression. Isometric contractions of the retracted muscles produced a reduction in muscle tone and decreased the pain, resulting in the progression of the posture toward recovery of the normal spinal curves. This position finished with hip and knee extension. In our series, the increase in lumbar muscular tone and pain at the herniated site required multiple axial tractions of the sacrum. In the second position, the patient was placed in the standing position with forward flexion of the trunk. This posture stretched the posterior muscles (lumbar, pelvis-trochanteric, ischiocrural, triceps surae, and plantar muscles), which are shortened in patients with a lumbar herniated disc. In the starting position, with occiput-trunk-lumbar spine alignment, patients were asked to flex the trunk forward until a sufficient tension in the posterior muscles was obtained. The physiotherapist put his hands on the sacrum and on the spinal column, performing axial traction and progressive decoarctation maneuvers (for overview see Souchard, 1994; Souchard et al., 2009) while patient is asked to perform an isometric contraction of the posterior shortened muscles in order to obtain the maximum elongation of the same. In all cases, it was necessary for the patients to rest their elbows on the examination table to lessen the load on the lower limbs and, thus, produce a general decrease in muscular tone. This maneuver permitted performance of the exercise in the standing position. All therapeutic sessions were carried out by a trained physiotherapist with eight years of experience in GPR.

Statistical Analysis

Patient demographic and clinical characteristics are summarized as frequencies and percentages. Continuous variables are reported as mean, median, and range of variation. The following variables were investigated in each patient: the average length of time spent in the sitting position during a 24-h period, participation in physical/sport activity at baseline and at the completion of treatment at 180 days (Yes/No and the number of activities), number of days pain was experienced, age, gender, body mass index (BMI, kg/m^2), and level of the disc lesion. The QBPDS and NPRS test scores are presented as median and range at the beginning of treatment (T1), and at treatment days 15 (T2), 45 (T3), 120 (T4), and 180 (T5). Differences in the median scores between T1 and T3 and between T3 and T5 were evaluated using the non-parametric Wilcoxon signed-ranks test for matched pairs. A p-value £ 0.05 was deemed to be statistically significant. Data were analyzed using the statistical software Stata10 (StataCorp LP, College Station, TX, USA).

Results

The study sample included twenty-four patients: 17 (71%) women and 7 (29%) men aged between 22 and 76 years who were outpatients with a specialized GPR physiotherapist in a private practice in Bologna, Italy. Most patients (63%) presented with HLID at the level of L5-S1, followed by L4-L5+L5-S1 (29%), and L4-L5 (8%). At T5, 40% of patients who did not engage in physical activities prior to treatment

had begun to participate in sports (water, gym, and swimming), and those who had been physically active prior to the HLID had returned to their original activities. Six months after the start of the study, 88% of the patients (21 of 24) were involved in a physical activity. The test scores are summarized in Table II. The median value of the QBPDS score decreased from 49 points at T1 to 22 points at T3, indicating a significant functional improvement of 55% ($p < 0.001$). Moreover, the median NPRS score decreased from 6 points at T1 to 2 points at T3, indicating an improvement of 66% ($p < 0.001$). However, no difference was observed between T4 and T5.

Discussion

Results of the present study indicate that GPR reduced the pain accompanying herniated discs at the level of L4-L5 and/or L5-S1 and improved physical function. However, the scores on the QBPDS and NPRS showed more improvement early in the GPR treatment (T1-T3) compared with the later stages (T3-T5). This pattern may be explained by the greater frequency of therapy sessions at the beginning of the study. Treatment was conducted in an outpatient setting on an individual basis to allow therapy tailored to each patient. The variability of clinical signs and symptoms in patients with HLID requires a versatile therapy that can address individual postural causes of the hernia. The GPR method offers up to eight therapeutic postures that the physiotherapist can choose from following a thorough clinical evaluation at the beginning of each therapeutic session. We used two therapeutic postures that we determined to be the most suitable for reeducation of patients with HLID for the follow reasons: the first one, executed in supine position, allows the discharge of spine. Conversely, posture in standing position, among others, permits the greatest elongation of the posterior muscles of the spine and of legs. We cannot exclude the possibility that we may have obtained more significant results had we used GPR postures involving a greater number of muscles. The questionnaire administered before the study revealed that patients found it difficult to remain in a sitting position for 30 consecutive minutes, and all were given instructions on how to improve their sitting posture. A review by Vanti et al[36] showed that studies have been conducted at various locations to evaluate the effects of the GPR in different clinical conditions. In a recent study of 78 patients with persistent low back pain, Bonetti et al[35] reported that GPR was more effective in improving pain and disability than was a stabilization exercise program. Apuzzo et al[37] combined oxygen-ozone therapy and GPR treatment in 40 patients with lumbar herniated disc. The 6-month follow up revealed a reduction in hernia volume and diminished pain. Our study evaluated the effect of GPR alone with no combined treatment or control group. The QBPDS scores in our study indicated that GPR therapy can restore function (particularly at 45 and 180 days). A small sample size and absence of a control group are limitations of the present study. Again, the observation period of up to 180 days was sufficient to show medium-term improvement in pain intensity and function. However, a follow-up assessment would have allowed us to determine the long-term effect of GPR on patient quality of life. Despite these limitations, we believe that our findings may advance the understanding of the effects of GPR treatment on HLID and will stimulate further research with experimental studies. The modern lifestyle encourages individuals to spend more time sitting, thus placing stress on the lumbar and lumbosacral joints and creating

Table II. Function and pain in patients (n = 24).

Variable	Observation[@] (median, min-max)				
	T1	T2	T3	T4	T5
QBPDS[§]	49 (32-70)	40 (21-65)	22 (4-48)	12 (3-26)	12 (1-25)
NPRS*	6 (3-8)	4 (2-6)	2 (0-6)	2 (0-3)	2 (1-4)

[@]Observations (T1=baseline, T2=15 days, T3=45 days, T4=120 days, T5=180 days) [§]QBPDS Quebec Back Pain Disability Scale, *NPRS Numeric Pain Rating Scale.

muscular retraction. Maintaining muscular elasticity, particularly in the paravertebral muscles and the lower limbs, will, over time, reduce the risk of HLID. The present study indicates that GPR therapy is suitable for the conservative management of HLID. Moreover, patients gained a therapeutic benefit from being active participants in their recovery.

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