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Effects of extracorporeal shock wave therapy on chronic low back pain and quality of life

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ABSTRACT

Objective: To assess the effects of extracorporeal shock wave therapy (ESWT) on chronic low back pain and quality of life.

Methods: A total of 200 patients with chronic low back pain who were treated in our hospital from February 2017 to February 2019 were divided into observation group (n=100) and control group (n=100) using a random number table. Patients in observation group underwent ESWT, while those in control group received super laser therapy. The degree of pain was evaluated using the visual analogue scale (VAS) and compared between the two groups before and after treatment. The quality of life of patients, including role physical, bodily pain, social function, general health, mental health and role emotional, was scored and compared between the two groups after treatment. The patients were followed up for 1 year after treatment, and the cases of walking difficulty, lumbar anteflexion, retroextension and side-flexion and spinal deformity were counted and compared between the two groups.

Results: The VAS score dropped markedly in both groups compared with that before treatment, and observation group had an evidently lower VAS score and a significantly higher effective rate than control group (94.00% *vs.* 64.00%, P<0.05). Besides, after treatment, the quality of life score in observation group was higher than that in control group (P<0.05), and observation group had a lower incidence rate of complications than control group (P<0.05).

Conclusion: ESWT has a prominent effect in the treatment of patients with chronic low back pain, and it can distinctly improve the quality of life of patients, with better prognosis.

KEYWORDS: extracorporeal shock wave therapy; chronic low back pain; effect; quality of life

INTRODUCTION

Low back pain refers to the syndrome with main symptoms of pain in back and waist in unilateral or bilateral lumbar vertebrae or sacral vertebrae in the small of back [1]. Chronic low back pain is a type of low back pain that lasts for more than 3 months. It is a common type of pain in the society currently, and a disease by its nature, which not only brings physical pain and dysfunction to patients, but also causes psychological, cognitive and emotional disorders and many social problems. It is featured by a high incidence rate, severe disability and a low consultation rate [2]. There are a variety of treatments for chronic low back pain in clinical practice, including drug therapy, physiotherapy and biological therapy, with different treatment effects on patients. Studies have shown that the treatment of chronic low back pain should focus on restoring the function of patients, enhancing the pain control ability of patients, and reducing the number of ineffective visits [3]. According to a foreign study, extracorporeal shock wave therapy (ESWT) has achieved good results in the treatment of urinary calculi, and it has been gradually applied to orthopedics [4]. Hence, the effect of ESWT in the treatment of chronic low back pain and its influence on the quality of life of patients were explored in this study, so as to provide a basis for clinical treatment. It is now reported as follows.

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MATERIALS AND METHODS

General data

In the period from February to February 2017, a total of 200 patients were admitted with chronic

low back pain treated at our hospital. 120 men and 80 women between forty and 60 years of age were suffering from 3 to 150 months of illness. There have been 120 cases of LD, 20 of LDS, 20 of LDS stenosis, 20 of LDS stenosis, 20 of LDI inflammation in a transverse process, and 20 of LTA arthritis. A random number table was used for division of patients into observation groups (n=100).

Inclusion and exclusion criteria

Inclusion criteria: (1) Patients with complete clinical data, (2) those with pain area below the costal margin, above the hip stripes, and between the midline of the axilla on both sides, with or without thigh pain, (3) those with symptoms lasting for at least 3 months, (4) those having no family history of mental illness, and (5) those with good treatment compliance.

Exclusion criteria: (1) Patients with other severe somatic diseases, (2) those with specific spinal diseases or radicular pain, (3) those who could not tolerate surgery, (4) those with severe autoimmune diseases, or (5) those with severe liver or kidney insufficiency.

Treatment methods

Patients in control group received super laser therapy, while those in observation group underwent ESWT. In observation group, the patients were treated with an HK. ESWO-AJ ESWT system (Shenzhen Huikang Medical Apparatus Co., Ltd.). During treatment, the patient took prone position and needed no anesthetic treatment. The low back of the patient was examined firstly. After the most painful point was determined, the balloon probe of the extracorporeal shock wave was aimed at that point, and the energy of the shock wave was adjusted to a dose tolerable for the patient. Generally, the impulse voltage is set as 7.0-9.0 kV, the impulse energy is 0.1-0.2 mJ/mm^2, and the times of shocks are set as 1200. ESWT was conducted usually for 1-2 courses, 5 times as 1 course. In control group, the patients were treated with a BYL-05C super laser therapeutic apparatus (Beijing Yulong Weikang Technology & Trade Co., Ltd.). The treatment site was centered on the pain point of low back, and the type C treatment head was adopted. The output power was set as 2800 mW, the diameter of light spot was 10 cm, and the exposure time was 15 min/time, once a week, with a total of 4 times.

Evaluation of therapeutic effects

The patients' low back pain was evaluated using the visual analogue scale (VAS). The evaluation criteria were as follows: 0 points = cured (the patient had no pain after treatment), 1-3 points = relieved (the pain was relieved, but did not disappear after treatment), over 3 points = ineffective (the pain was relieved compared with that before treatment, but the effect was not obvious). The total effective rate was calculated according to the formula below: Total effective rate = (cured cases + relieved cases)/the total cases.

(1) Observation indices

(1) VAS scoring: VAS was used in both pre- and post-treatment groups to evaluate the degree of pain. (2) Quality of life: After treatment, quality of life for patients in both groups was assessed, including the role of body pain, body pain, social role, health and mental health. (3). Complications: 1 year after patient treatment, patients have been treated with follow-up after a walk, lumbar antidote, retro-extension, side flexion and spinal deformation have been reported. The higher the score the better the patient's quality of life.

(2) Statistical analysis

For statistical analysis the SPSS 22.0 software was used. Quantitative data were expressed as mean ± standard deviation (i.e. ± s) according to the normal distribution and t-tests have been carried out for intergroup comparison. The numerical data have been shown as a (n) or a (percentage) of the case and tested for 5-0072. The difference was statistically significant, according to $P < 0.05$.

RESULTS

Baseline clinical data

There were no significant differences in gender, average age, mean disease rate, body mass index (BMI) and pain causes between the two groups ($P>0.05$), which were comparable (Table 1).

VAS scores before and after treatment

Before treatment there was no significant differential in the VAS value between both groups ($P>0.05$). In contrast to the checks and statistical difference ($P<0.05$), the overall efficacy in the observing group was significantly higher after treatment (Table 2). (Table 2).

Quality of life indices after treatment

The quality of life indicator was compared between the two groups. In the group of observations, the results of physical, social, general, mental, physical and emotional vitality have been significantly larger than in the control group, while bodily pain was significantly lower in the group of

observations than in the control group and statistically important differences have been observed. (P<0.05) (Table 3).

Incidence of postoperative complications

The two patient groups were compared with complications following the surgery. Results showed many complications for patients like walking difficulty, lumbar anteflections, retro-extension, side spinal flange and spinal deformity and a significantly lower overall effect on the control group complications.

Table 4 (P<0.05).

Table 1. **Baseline clinical data**

Group		Observation group (n=100)	Control group (n=100)	Statistical value	P
Gender (n)	Male	60	60	0.000	1.000
	Female	40	40		
Average age (year)			44.45±8.27	44.53±8.19	0.069
Average course of disease (month)			79.56±7.21	78.97±7.24	0.577
BMI (kg/m^2)			15.32±1.79	15.42±1.88	0.385
Causes of pain (n)	Lumbar disc protrusion	60	60	0.983	0.143
	Lumbar muscle strain	8	12		
	Lumbar spinal stenosis	12	8		
	Transverse process inflammation	10	10		
	Lumbar facet arthritis	10	10		

Table 2. **VAS scores before and after treatment**

Group		Observation group (n=100)	Control group (n=100)
Before treatment (point)		6.26±1.08	6.27±1.12
After treatment (n)	0 points	60	20
	1-3 points	4	44
	>3 points	6	36
Total effective rate (%)		94.00	64.00

Table 3. Quality of life indices after treatment

Group	Observation group (n=100)	Control group (n=100)	*t*	P
Role physical	5.27±0.89	4.51±0.76	6.494	0.000
Bodily pain	5.04±0.76	6.53±0.84	13.153	0.000
Social function	5.18±0.71	4.35±0.79	7.814	0.000
General health	20.56±1.56	19.24±1.57	5.964	0.000
Mental health	19.57±2.89	17.32±2.65	5.738	0.000
Physical functioning	19.45±2.76	18.12±2.58	3.520	0.001
Role emotional	3.35±0.46	3.01±0.43	5.400	0.000
Vitality	15.57±2.14	13.13±2.08	8.176	0.000

Table 4. **Incidence of postoperative complications [n (%)]**

Group	Observation group (n=100)	Control group (n=100)	χ^2	P
Walking difficulty	2 (2.00)	4 (4.00)		
Lumbar anteflexion	4 (4.00)	2 (2.00)		
Lumbar retroextension	2 (2.00)	4 (4.00)		
Lumbar side-flexion	0 (0.00)	4 (4.00)		
Spinal deformity	0 (0.00)	4 (4.00)		
Incidence rate	8 (8.00)	18 (18.00)	4.421	0.036

DISCUSSION

Low back pain is one of the most frequently reported conditions in clinical practise, and pain and limited motion are most fundamental to chronic low back pain. Pain changes the contraction pattern of the trunk muscles and reduces their activity, resulting in atrophy of the muscles. Chronic low back pain caused by low back muscle spasms is more common in operations, and most patients recover within a one to two-month period, however,

some serious and acute patients without recovery may develop chronic pain [4] [5].

A study has manifested that [6] the occurrence of chronic low back pain is rarely caused by a single factor, but is the result of a variety of psychological and physical factors. Among them, hyperactivity of normal muscles can easily lead to low back muscle strain, osteoarthritis, lumbar disc protrusion and spinal stenosis, thus triggering chronic mechanical low back pain [7]. Such pain from the low back muscle strain leads to a static muscle contraction, thus decreasing low back activity as a self-protection reaction. Meanwhile, muscle spasm decreases muscle blood flow and vasoconstriction is facilitated by the buildup of metabolites, all of which help to reduce chronically low dick. Further academics gathered low pain into three categories; specific low back pain and radicular, low back pain.[8] Foreign students were divided into three categories. The particular pathological site cannot be identified for lung-specific low back pain. Certain diseases such as tumour, infection, and fracture are responsible for specific low back pain. Low dorsal radical pain caused by or bulging of the intervertebral disc. Moreover, low back pain duration can be divided into acute low back pain, low back pain subacute and chronic low back pain [9].

A number of clinical methods, including medical treatment and surgical treatment, have been adopted for the treatment of chronic low back pain. In the original clinical application, ESWT was used by German medical scientists to protect patients from surgical treatment pains [9]. With the passage of time, ESWT techniques have gradually matured and its clinical use is expanding. In addition, many clinical trials showed that patients are nearly not hospitalised after ESWT. ESWT significantly reduces pain in patients, leads to fewer complications, shortens therapy times, and is highly secure. Domestic scholars have used ESWT to treat a range of low back pains over the last couple of years. ESWT primarily works for the treatment of chronic low back pain by direct mechanical effects of the shock wave and indirectly caused mechanical effects by cavitation [10].

When the shock wave enters human bodies, different mechanical effects can be produced at the interface of different tissues due to different contact media, such as fat, tendons and ligaments, and bone tissue, thus producing different forces on cells ultimately. Among the forces, tensile stress can relax the tissue and promote microcirculation, while compressive stress can change the elasticity of cells and increase the ability of cells to absorb oxygen, so as to achieve the purpose of treatment. In addition, when the shock wave is transmitted into the tissue of human bodies, due to the existence of a large number of tiny bubbles between the tissues, the bubbles will expand under the action of the shock wave, which will eventually accelerate the microcirculation at the impact site and improve the local blood circulation, thereby exhibiting a therapeutic effect. Furthermore, high-intensity shock wave can produce strong stimulation to the nerve endings in a small range, which can prominently reduce the nerve sensitivity and block the nerve conduction, thus relieving the pain.

The Lee et al. [11] study has shown that chronically low back pain will significantly be alleviated in patients following ESWT. In the Xu et al. [12] study, ESWT can effectively alleviate, inhibit and improve lumbar flexibility compared with magnetic resonance thermotherapy, the clinical symptoms and symptoms of chronic unspecified low back pain. In the Zheng et al. research [13], ESWT may reduce pain in patients compared to surgery. The VAS score for patients decreased after treatment significantly, with an observation group having especially higher efficacy than the control group, indicating that it is more effective in chronic low back pain patients. Based on the results of this study It can be due to the fact that ESWT can encourage vasodilation, stimulate blood circulation, stimulate nervous fibre stimulation and prevent an increase in pain, improving the patient analgesic effect, which is consistent with many of the scholars mentioned earlier. Moreover, the study also found that a clear improvement in quality of living was reported in the observation group compared to the control group and that ESWT could significantly improve the quality of life of chronic low back pain patients. This may be because ESWT can improve inflammatory response and remove patients' edoema. This finding reflects the findings of Kang et al. [10]. The comparison between both groups showed that post-operative complications were clearly lower incidences than those in the control group, and ESWT could reduce complications in patients with chronic low back pain and produce a better prognosis. Furthermore, the results show that postoperative complications were less prevalents in both groups. This is probably because ESWT is a type of minimum invasive therapy that is consistent with the findings of Liu et al. [14] and is lower trauma for patients and greater safety. In summary, ESWT is effective in treating patients with chronic low back pain and can substantially improve patients ' quality of life and lead to a good safety

pronostic that is worthy of further promotion.

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