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Original Article

Effects of oral OsteoKing on pain, lumbar function, and inflammatory markers in patients with lumbar disc herniation

Yanshu Jiang, Jian Jiang, Hongye Zhai

Department of Orthopedics and Traumatology, Jilin Academy of Chinese Medicine Sciences, Changchun 130022, Jilin, China

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Abstract: Objective: To investigate the effects of oral administration of OsteoKing on pain, lumbar spine function, and serological indicators in patients with lumbar disc herniation (LDH). Method: A retrospective analysis was conducted on clinical information of 266 LDH patients treated at Jilin Academy of Chinese Medicine Sciences between October 2023 and March 2024. According to treatment method, patients were divided into the conventional group (Celecoxib treatment) and the OsteoKing group (OsteoKing). Clinical outcomes were compared between the two groups, and ordinal logistic regression analysis was conducted to identify factors influencing the therapeutic efficacy of OsteoKing. Result: After treatment, the OsteoKing group demonstrated significantly better treatment outcomes and greater improvement in lumbar spine function compared to the conventional group ($P<0.05$). Scores on the McGill Pain Questionnaire Short Form (SF-MPQ) were markedly lower in the OsteoKing group than those in the conventional group ($P<0.05$). Serum levels of interleukin-6 (IL-6) and tumor necrosis factor-α (TNF-α) in the OsteoKing group greatly decreased, while the level of β-endorphin significantly increased, and the change amplitude was greater than that in the conventional group ($P<0.05$). Quality of life, assessed by the World Health Organization Quality of Life Brief (WHOQOL-BREF), improved more substantially in the OsteoKing group ($P<0.05$). Treatment satisfaction was also higher in the OsteoKing group compared with the conventional group (93.23% vs. 84.21%). Ordinal logistic regression analysis showed that gender, age, BMI, diabetes, hypertension, and pre-treatment JOA score did not significantly influence the therapeutic effect of OsteoKing (all $P>0.05$). Conclusion: OsteoKing effectively alleviates pain, improves lumbar spine function, and reduces serum inflammatory factor levels in patients with LDH, thereby mitigating inflammatory responses. Additionally, OsteoKing significantly enhances patients' quality of life, with high safety and good patient satisfaction, supporting its clinical value as a therapeutic option.

Keywords: Lumbar disc herniation, OsteoKing, lumbar spine function, inflammatory factors, quality of life

Introduction

Lumbar disc herniation (LDH) is a common spinal disease characterized by rupture of the fibrous ring of the lumbar disc, protrusion or prolapse of the nucleus pulposus, compression of the nerve roots or spinal cord, leading to symptoms such as lower back pain, lower limb radiating pain (sciatica), numbness, and weakness [1, 2]. The predominant clinical manifestation is lower back pain radiating along the sciatic nerve to the lower limbs, often accompanied by numbness, fatigue, and even intermittent claudication [3, 4]. In severe cases, patients may develop urinary and fecal dysfunction, seriously affecting patient's daily activities and work ability [5]. Epidemiological investigation shows that the incidence of LDH has been increasing annually and tends to occur at younger ages, making it a leading cause of chronic pain and disability worldwide [6, 7].

Treatment methods for LDH mainly include two categories: surgical and non-surgical approaches. Surgical intervention is generally indicated for patients with severe pain due to nerve compression and significant impairment of normal life [8, 9]. However, surgery is associated with risks, such as significant trauma, postop-

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erative infection, neurovascular injury, and a higher risk of postoperative recurrence [10]. In addition, the cost of surgical treatment is relatively high, which to some extent increases the economic burden on patients. In contrast, for patients with mild symptoms who seek timely medical care, non-surgical management offers advantages including lower risk, fewer complications, reduced costs, and better patient acceptance [11, 12].

Drug therapy is one of the most commonly used non-surgical treatments for patients with LDH. In western medicine, non-steroidal anti-inflammatory drugs (NSAIDs) are often prescribed to relieve pain and inflammation, muscle relaxants to reduce spasms, and neurotrophic drugs such as vitamin B to promote the nerve recovery [13]. Although these drugs can provide effective short-term symptoms relief, their long-term use may lead to adverse effects, including gastrointestinal discomfort and impairment of liver and kidney functions [14]. Traditional Chinese medicine (TCM), based on the holistic concept, emphasizes regulating the balance of qi, blood, Yin and Yang, promoting local circulation, and relieving LDH-related symptoms [15]. OsteoKing, originated from ancient Yi ethnic prescriptions and preserved for centuries, consists of multiple herbal components, such as Astragalus membranaceus (Huangqi), Panax ginseng, Carthamus tinctorius (safflower), *Panax notoginseng* (Sanqi), Eucommia ulmoides, turtle shell, tangerine peel, diamond wind, and goldenrod. These ingredients synergistically promote blood circulation, tonify qi, disperse blood stasis, and relieve pain [16]. A distinctive feature of OsteoKing lies in its integration of Yi traditional medicine with modern pharmacological research. Through standardized extraction process and quality control, the preparation ensures consistent levels of active compounds, thus demonstrating favorable efficacy and safety in clinical application [17]. This study aims to evaluate the effects of oral OsteoKing on pain, lumbar function, and serological markers in patients with LDH, with the goal of elucidating its therapeutic potential in symptom relief, functional recovery, and inflammation regulation, thus providing a more scientific and effective treatment plan for clinical practice.

Materials and methods

General information

Clinical data of 266 LDH patients who visited Jilin Academy of Chinese Medicine Sciences between October 2023 and March 2024 were retrospectively collected. This study was approved by the Ethics Committee of Jilin Academy of Chinese Medicine Sciences.

Inclusion criteria: (1) Meeting the diagnostic criteria for LDH [18]: i) typical symptoms of back pain or radiating pain in the lower limbs; ii) positive femoral nerve traction test or positive straight leg elevation test (+); iii) LDH confirmed by MRI or CT examination; (2) Disease duration >4 weeks without significant improvement; (3) Not meeting surgical indications or unable to tolerate surgery; (4) Complete clinical and laboratory data available for this study.

Exclusion criteria: (1) Severe hepatic or renal dysfunction; (2) Malignant tumors; (3) Psychiatric disorders; (4) Allergy to study medications; (5) History of lumbar spine surgery.

Grouping treatment methods

All patients received health education and lifestyle guidance. Based on treatment plans, patients were divided into two groups: (1) Conventional group: Celecoxib capsules (Pfizer Inc.; specification: 0.2 g/capsule; National Medical Products Administration Approval Number: J20140072) were administered at 0.2 g twice daily, for 6 consecutive weeks. (2) OsteoKing group: In addition to the treatment in the conventional group, OsteoKing oral solution (Sailing Pharmaceutical Technology Group Co., Ltd.; specification: 25 mL/bottle; National Medical Products Administration Approval Number: Z20025103) was prescribed at 25 mL/time, once every other day, for 6 consecutive weeks.

Observation indicators

(1) Therapeutic effect: The Japanese Orthopedic Association (JOA) score [19] was used to evaluate treatment efficacy. The JOA scale comprises four dimensions: subjective symptoms (0-9 points), clinical signs (0-6 points), restriction of daily activities (0-14 points), and

bladder function (-6-0 points), with a total score range of 0-29 points. Lower scores indicate more severe functional impairment. The improvement rate was calculated as: (post-treatment score - pre-treatment score)/(total score - pre-treatment score) × 100%.

According to the JOA score and relevant clinical symptoms, the therapeutic effect was categorized into three levels. Significantly effective: improvement rate >60%; functional symptoms markedly improved, with little or no impact on daily life and work. Effective: improvement rate of 25-60%; symptoms relieved with partial improvement in lumbar function, though daily activities remain partially affected. Ineffective: Improvement rate <25%; show minimal or no improvement.

(2) Pain assessment: The Short Form McGill Pain Questionnaire (SF-MPQ) [20] was used to evaluate the patient's lumbar pain before and after treatment. SF-MPQ includes 17 items in three subscales: Pain Rating Index (PRI), Visual Analog Scale (VAS), and Present Pain Intensity (PPI) score. PRI consists of 15 items, including sensory (11 items) and affective (4 items) descriptors. Each item is rated on a 4-point scale (0 = no pain, 3 = severe pain), with a total score of 0 to 45. VAS is a 1-10 scale, where 0 indicates no pain and 10 indicates the highest level of pain. Patients select the number corresponding to their perceived pain intensity. PPI is scored based on a 0-5 scale, where 0 indicates no pain and 5 indicates extreme pain. Patients choose the corresponding level based on their current pain intensity.

(3) Lumbar spine function: The Oswestry Disability Index (ODI) [19] was used to evaluate lumbar spine function before and after treatment. The ODI includes 10 dimensions: pain intensity, self-care, lifting, walking, sitting, standing, sleep, sexual activity, social activity, and travel. Each item has 6 response options scored from 0 to 5. If all 10 questions were answered, the total score = actual score/(5*10) × 100%; If 9 items were answered, the total score = actual score/(5*9) × 100%. Similarly, a higher score indicates greater functional limitation.

(4) Serological indicators: Approximately 10 mL of fasting venous blood was collected before and after treatment. After centrifugation, serum levels of interleukin-6 (IL-6), tumor necrosis factor-α (TNF-α), and β-endorphin (β-EP) were measured using enzyme-linked immunosorbent assay (ELISA).

(5) Quality of Life: The World Health Organization Quality of Life Brief (WHOQOL-BREF) [21] was used to evaluate patients' quality of life before and after treatment. This scale consists of 26 items, of which 2 items assess overall quality of life, and the remaining 24 items are distributed across four domains: physical health (7 items), psychological well-being (6 items), social relationships (3 items), and environment (8 items). Each item is scored on a 5-point scale, with a raw score range of 26-130. Scores were converted to a 0-100 scale according to the following formula: Raw score - Minimum possible score)/Possible score range × 100. A higher WHOQOL-BREF score indicates a better quality of life.

(6) Treatment safety: The incidence of adverse reactions, including nausea, vomiting, abdominal distension, diarrhea, and decreased appetite, was recorded and compared between the two groups during treatment.

(7) Treatment satisfaction: A self-made treatment satisfaction questionnaire was used to evaluate patient satisfaction with the treatment plan and efficacy. The total score ranges from 0 to 100, with higher scores indicating greater satisfaction. Satisfaction was divided into three levels: very satisfied (>90 points), satisfied (70-90 points), and not satisfied (<70 points).

Statistical analysis

All data were analyzed using SPSS 25.0. Quantitative data with normal distribution were expressed as mean ± standard deviation (x ± sd). Independent-samples t-test was performed for between-group comparisons, and repeated measures analysis of variance (ANOVA) was applied for comparison across multiple time points. Non-normally distributed data were expressed as median (P_{25}, P_{75}), and intergroup comparisons were performed using the rank sum test. Categorical variables were expressed as n (%), with between-group comparisons conducted using the chi-square test. For ranked data, the rank-sum test was applied. A

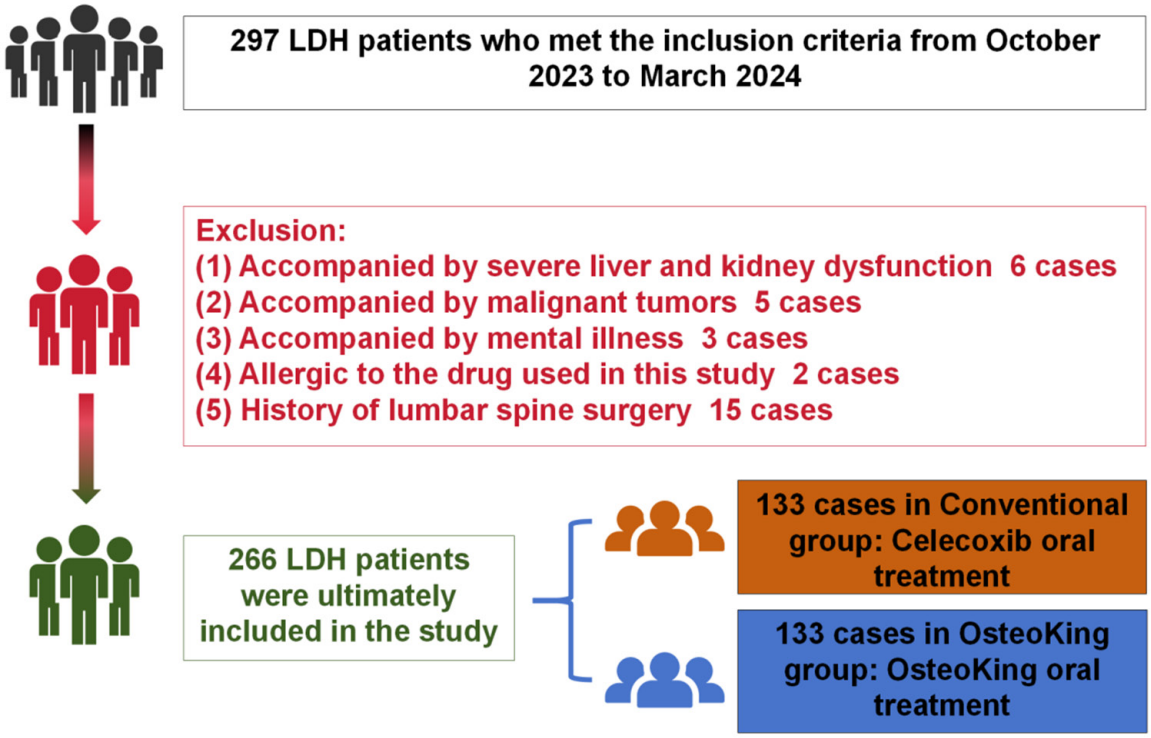

Figure 1. Research flow chart.

two-sided *P* value <0.05 was considered statistically significant.

Results

Enrollment of research subject

A total of 266 LDH patients who met the inclusion and exclusion criteria were enrolled. According to treatment protocol, 133 patients treated with oral celecoxib were included in the conventional group, and the other 133 patients treated with oral OsteoKing were included in the OsteoKing group. The enrollment process is illustrated in **Figure 1**.

Baseline data of research subjects

Baseline characteristics, including gender, age, BMI, disease duration, herniation site, and comorbidities, are summarized in **Table 1**. No significant differences were observed between the two groups (all *P*>0.05), indicating comparability of baseline data.

Treatment effect

As shown in **Figure 2**, baseline JOA scores were comparable between the two groups (*P*>0.05). After treatment, both groups exhibited significant improvement in JOA scores compared to baseline level (*P*<0.05). Moreover, the increase in JOA scores was significantly greater in the OsteoKing group than that in the conventional group (*P*<0.05). The overall therapeutic efficacy in the OsteoKing group was significantly higher than that in the conventional group (89.47% vs. 66.17%; *P*<0.05; **Table 2**).

Pain assessment

As shown in **Table 3**, baseline pain scores, including PRI sensory, PRI affective, PRI total, VAS, and PPI, were comparable between the two groups (all *P*>0.05). After treatment, pain scores in both groups decreased significantly, with the OsteoKing group demonstrating significantly lower scores than the conventional group (both *P*<0.05).

Lumbar spine function

Results of repeated measures ANOVA (**Table 4**) showed that the time effect (before vs. after treatment) significantly influenced ODI score (F_{time}=262.000, *P*<0.001), indicating that the lumbar function improved over time in both

Table 1. Comparison of baseline data between the two groups

Parameters	Conventional group (n=133)	OsteoKing group (n=133)	χ^2/t	*P*
Gender			0.596	0.440
Male	82 (61.65)	75 (56.39)		
Female	51 (38.35)	58 (43.61)		
Age (years)	49.65±4.25	49.58±4.05	0.133	0.84
BMI (kg/m^2)	24.59±1.07	24.52±1.12	0.499	0.619
Course of illness (months)	13.09±3.01	13.74±2.97	1.178	0.076
Lumbar protrusion site			0.246	0.620
$L_{4\text{-}5}$	55 (41.35)	59 (44.36)		
L_5-S_1	78 (58.65)	74 (55.64)		
Diabetes			0.283	0.595
Yes	17 (12.78)	20 (15.04)		
No	116 (87.22)	113 (84.96)		
Hypertension			0.741	0.389
Yes	35 (26.32)	29 (21.80)		
No	98 (73.68)	104 (78.20)		

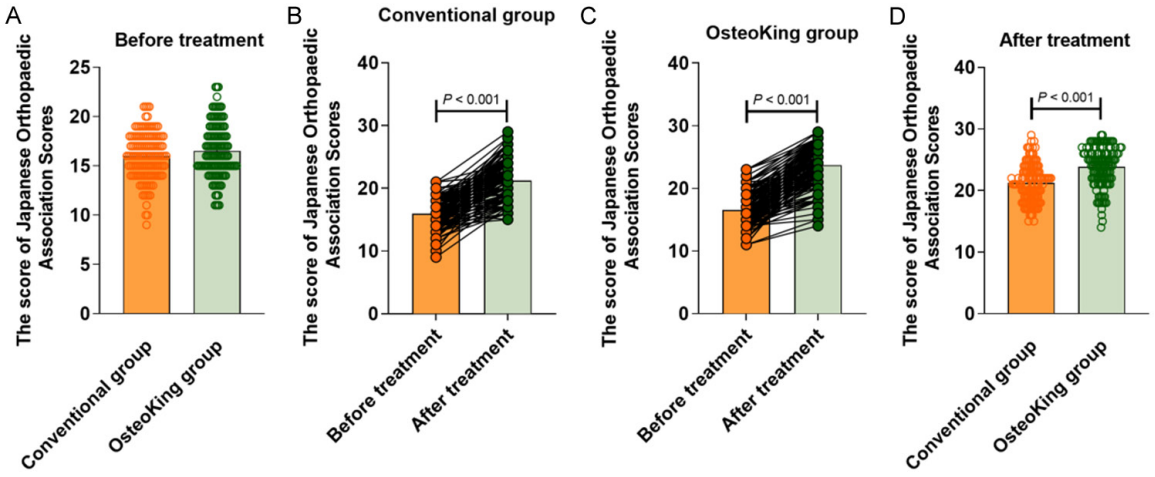

Figure 2. Comparison of JOA scores between the two groups before and after the treatment. A. Comparison of pre-treatment JOA scores between the two groups; B. Comparison of JOA scores before and after the treatment in the conventional group; C. Comparison of JOA scores before and after the treatment in the OsteoKing group; D. Comparison of post-treatment JOA scores between the two groups. Note: JOA, Japanese Orthopaedic Association.

Table 2. Comparison of clinical efficacy between the two groups

Groups	Significantly effective	Effective	Ineffective
Conventional group (n=133)	29 (21.80)	59 (44.37)	45 (33.83)
OsteoKing group (n=133)	69 (51.88)	50 (37.59)	14 (10.53)
Z		5.762	
P		<0.001	

groups. The group effect (OsteoKing vs. conventional) on ODI score was also significant (F_{group}=48.196, *P*<0.001), indicating different efficacy across treatment regimens. Moreover, the time × group interaction was significant ($F_{interaction}$= 34.648, *P*<0.001), confirming that the improvement in ODI scores was more pronounced in the OsteoKing group compared with the conventional group.

Serological indicators

As shown in **Figure 3**, baseline levels of IL-6, TNF-α, and β-EP did not differ significantly

Table 3. Comparison of pain level between the two groups before and after the treatment

Index	Conventional group (n=133)	OsteoKing group (n=133)	*t*	*P*
PRI sensation				
Before treatment	16.56±3.01	17.08±3.14	1.375	0.170
After treatment	6.78±1.65*	4.64±1.88*	0.053	<0.001
PRI affection				
Before treatment	7.16±1.32	7.35±1.25	0.760	0.234
After treatment	2.60±0.61*	1.86±0.59*	0.002	<0.001
PRI total score				
Before treatment	23.71±3.25	24.42±3.24	0.455	0.077
After treatment	9.38±1.69*	6.50±1.91*	0.074	<0.001
VAS				
Before treatment	6.71±0.71	6.86±0.77	0.848	0.101
After treatment	3.15±0.93*	2.74±1.07*	0.103	0.001
PPI				
Before treatment	2.79±0.89	2.76±0.78	0.270	0.715
After treatment	1.77±0.70*	1.51±0.66*	0.666	0.002

Note: Compared with before treatment, *P<0.05.

Table 4. Comparison of lumbar spine function between the two groups before and after the treatment

Group	Before treatment	After treatment		
		1 week	3 weeks	6 weeks
Conventional group (n=133)	46.10±3.75	35.10±4.97	32.11±4.44	29.97±3.38
OsteoKing group (n=133)	46.65±3.64	31.11±4.57	28.95±4.07	26.29±2.00
F_{group}	48.196	P_{group}	<0.001	
F_{time}	262.000	P_{time}	<0.001	
$F_{interaction}$	34.648	$P_{interaction}$	<0.001	

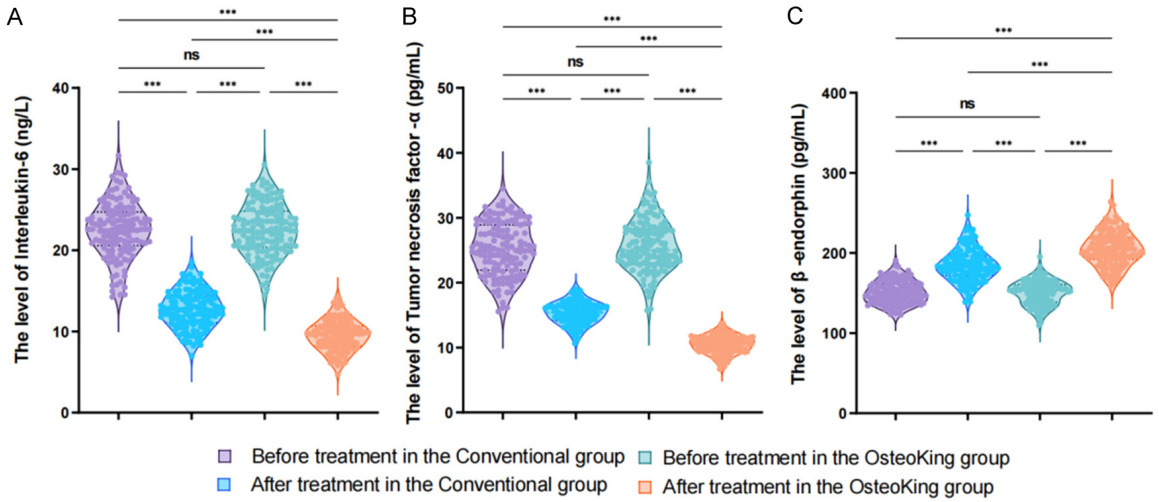

Figure 3. Comparison of serum levels of inflammatory markers between the two groups before and after the treatment. (A) Interleukin-6, (B) Tumor necrosis factor-α, (C) β-endorphin. Note: ***P<0.001, ^{ns}P>0.05.

between the two groups (P>0.05). After treatment, IL-6 and TNF-α levels significantly decreased, while β-EP level significantly increased in both groups. Notably, these changes

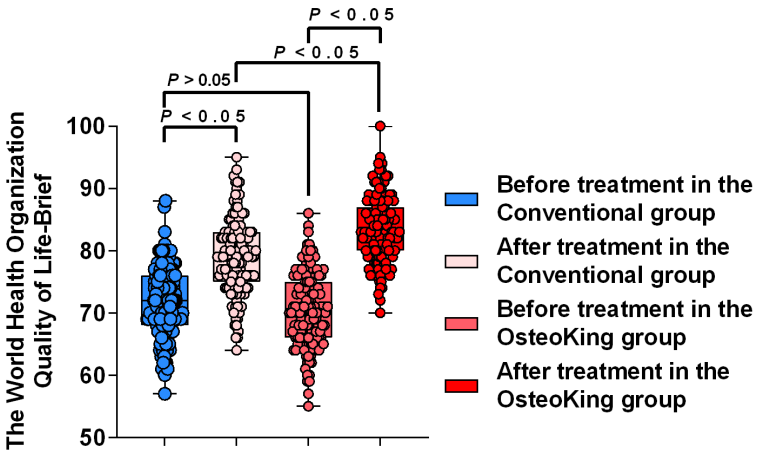

Figure 4. Comparison of patients' quality of life between the two groups before and after the treatment.

were more prominent in the OsteoKing group compared to the conventional group (all $P<0.05$).

Quality of life

As shown in **Figure 4**, baseline WHOQOL-BREF scores were comparable between the two groups (71.76±5.57 vs. 70.20±5.90, $P>0.05$). After treatment, WHOQOL-BREF scores increased significantly in both groups. The OsteoKing group showed greater improvement (83.32±5.39) compared with the conventional group (79.05±5.96) ($P<0.05$).

Treatment safety

During treatment, the overall incidence of adverse reactions, including nausea and vomiting, abdominal distension, diarrhea, and anorexia, was lower in the OsteoKing group than that in the conventional group (6.02% vs. 10.53%), but the difference was not statistically significant ($P>0.05$), as shown in **Table 5**.

Treatment satisfaction

As shown in **Table 6**, the overall patient satisfaction with treatment was significantly higher in the OsteoKing group compared with the conventional group (93.23% vs. 84.21%; $P<0.05$). Specifically, the proportion of patients reporting "very satisfied" was larger (51.88% vs. 35.34%), and the proportion reporting "not satisfied" was smaller (6.77% vs. 15.79%).

Analysis of factors affecting the therapeutic effect of OsteoKing

In the OsteoKing group, potential influencing factors were analyzed using ordinal logistic regression. The treatment effect was defined as the dependent variable (1 = Significant effect, 2 = Effective, 3 = Ineffective), while gender (1 = female, 2 = male), age, BMI, disease duration, diabetes (1 = No, 2 = Yes), hypertension (1 = No, 2 = Yes), and pre-treatment JOA score were included as independent variables.

The parallel lines test showed $P=0.139$ (>0.05), indicating that proportional odds assumption was met and the regression model was valid. Ordinal Logistic regression analysis (**Table 7**) showed that none of the variables, including age, BMI, disease duration, diabetes, hypertension, or pre-treatment JOA score, significantly affected the therapeutic efficacy of OsteoKing (all $P>0.05$).

Discussion

The lumbar intervertebral disc, composed of the annulus fibrosus, nucleus pulposus, and cartilaginous endplate, plays a key role in connecting adjacent vertebral bodies and maintaining spinal stability. As age increases, the water content of the disc gradually decreases, collagen fibers in the annulus fibrosus degenerate and rapture, the elasticity of the nucleus pulposus declines, and the load-bearing capacity of the disc weakens [22]. Under external mechanical stress or prolonged poor posture, the fibrous ring is prone to rupture, leading to protrusion of the nucleus pulposus and compression of adjacent nerve structures, thereby causing LDH [23, 24].

LDH is more common in young and middle-aged people, especially those engaged in physical labor or sedentary occupations that impose excessive stress on the lumbar spine. In the elderly, LDH is often considered as a result of lumbar disc degeneration. In recent years, with the deepening of research on LDH management, traditional Chinese medicine (TCM)

Table 5. Comparison of adverse reactions between the two groups

Group	Nausea and vomiting	abdominal distension	Diarrhea	Anorexia	Total incidence rate
Conventional group (n=133)	6 (4.51)	3 (2.26)	5 (3.76)	9 (6.77)	14 (10.53)
OsteoKing group (n=133)	3 (2.26)	2 (1.50)	1 (0.75)	5 (3.76)	8 (6.02)
χ^2					1.784
P					0.182

Table 6. Comparison of patient satisfaction between the two groups

Groups	Very satisfied	Satisfied	Not satisfied	Total satisfaction rate
Conventional group (n=133)	47 (35.34)	65 (4.87)	21 (15.79)	112 (84.21)
OsteoKing group (n=133)	69 (51.88)	55 (41.35)	9 (6.77)	124 (93.23)
χ^2				5.410
P				0.020

Table 7. Ordinal Logistic regression analysis of treatment outcome

Variable	β	SE	Wald χ^2	P	OR	95% CI
Gender	-0.469	0.346	1.832	0.176	0.626	0.317-1.234
Age	0.074	0.044	2.796	0.095	1.077	0.987-1.174
BMI	0.102	0.156	0.427	0.513	1.107	0.816-1.502
Disease duration	-0.029	0.059	0.242	0.623	0.972	0.866-1.090
Diabetes	-0.100	0.483	0.043	0.836	0.905	0.351-2.334
Hypertension	-0.096	0.417	0.053	0.819	0.909	0.401-2.060
Pre-treatment JOA score	-0.016	0.065	0.059	0.809	0.984	0.867-1.118

has attracted growing interest for its potential to alleviate symptoms and improve functional outcomes in LDH patients.

This study compared the treatment efficacy between OsteoKing and conventional groups and found that OsteoKing provided additional advantages in improving clinical symptoms and functional outcomes, especially in pain relief and lumbar spine function recovery. From the perspective of overall treatment efficacy, JOA score in the OsteoKing group was significantly higher than that in the conventional group, highlighting its superior effectiveness in alleviating functional impairment. The JOA score comprehensively reflects improvement in subjective symptoms, clinical signs, restriction in daily activities, and bladder function [25]. These observed therapeutic benefits of OsteoKing may be attributed to its multi-target mechanism of action. Components with blood-activating and stasis-removing properties, such as *Panax notoginseng* and safflower, enhance local blood circulation, improve microcirculation, and reduce inflammation and exudation, thereby relieving nerve root compression. Meanwhile, qi-tonifying ingredients, including ginseng and astragalus, enhance immune function and anti-inflammatory capacity, further promoting tissue repair and functional recovery [26, 27]. When comparing overall efficacy, the OsteoKing group exhibited a significantly effective rate of 51.88%, significantly higher than 21.80% in the conventional group, while the ineffective rate in the OsteoKing group was only 10.53%, significantly lower than 33.83% in the conventional group. This indicates that the addition of Osteokine provides better therapeutic effects in relieving symptoms and improving function. Celecoxib exerts its therapeutic effects primarily by inhibiting cyclooxygenase (COX) activity, thereby reducing prostaglandin synthesis and producing anti-inflammatory and analgesic effects. However, its single-target mechanism, combined with the risk of resistance and adverse effects upon long-term use, limits its clinical application [28]. OsteoKing, through the synergistic action of

multiple TCM components, not only exerts anti-inflammatory and analgesic effects but also facilitates tissue repair and functional recovery, thereby achieving a more comprehensive therapeutic outcome.

The mechanism of TCM in regulating inflammatory factors is complex, involving the synergistic effects of multiple active components, diverse biological activities, and holistic treatment philosophy. This regulatory process not only targets local inflammatory responses associated with disease but also optimizes the overall immune homeostasis of the human body. IL-6 is a pleiotropic cytokine, and its overexpression in LDH is closely related to nerve root inflammation. Elevated IL-6 induces inflammatory cell infiltration, exudation, and edema around nerve roots, thereby worsening compression and pain [29]. This study found that OsteoKing more effectively reduced serum IL-6 levels in LDH patients compared to celecoxib monotherapy. TNF-α, a key pro-inflammatory cytokine secreted mainly by macrophages, monocytes, and neutrophils, regulates cytokine production and cell survival to maintain tissue homeostasis. In LDH, TNF-α overexpression intensifies nerve root inflammation, drives intervertebral disc degeneration, and contributes to fibrous ring rupture, worsening the condition. The study showed that while both treatments significantly reduced TNF-α levels, the decrease was more pronounced in the OsteoKing group, indicating enhanced modulation of TNF-α. β-EP, an endogenous opioid peptide, exerts analgesic effects by binding to opioid receptors and inhibiting nociceptive signal transmission [30]. In this study, β-EP levels increased significantly in both groups, with greater elevation in the OsteoKing group, reflecting its ability to enhance endogenous analgesia and augment pain relief. The observed anti-inflammatory and analgesic effects of OsteoKing may be attributed to its bioactive components acting on multiple signaling pathways.

Panax notoginseng saponins, for example, have been shown to inhibit TNF-α and IL-6 secretion by macrophages, exerting anti-inflammatory effects [31]. Additionally, quercetin and β-sitosterol in OsteoKing can bind to targets like AKT1, IL-6, and TNF, suppressing pro-inflammatory factor production [32]. Recent studies further suggest that OsteoKing may reduce inflammation by blocking the ZBP1-STAT1-PKR-MLKL pathway, thereby regulating inflammatory cell death and downstream immune responses [33].

In this study, patients in the OsteoKing group experienced a greater improvement in quality of life after treatment, which can be attributed to its superior analgesic effect, enhanced lumbar function, and multi-target mechanism involving immune regulation, nerve regeneration, and tissue repair. Regarding treatment safety, the OsteoKing group demonstrated a lower incidence of adverse reactions. Furthermore, higher patient satisfaction in the OsteoKing group underscores its clinical value, facilitating better recovery of daily activities and work capacity, which is crucial for long-term management and rehabilitation of LDH. Importantly, ordinal Logistic regression analysis revealed that gender, age, BMI, diabetes, hypertension, and pre-treatment JOA score had no influence on therapeutic outcomes, suggesting that OsteoKing maintains consistent efficacy across diverse patient subgroups.

However, this study has several limitations. First, the sample size was relatively small, and the follow-up time was short, limiting the ability to assess long-term efficacy and safety. Second, as a retrospective study, it is subject to potential selection bias and confounding factors. In addition, the self-designed satisfaction questionnaire used in this study has not been rigorously validated for reliability and validity, which may have affected the accuracy of patient-reported outcomes. Future research should adopt a prospective, randomized controlled trial design with larger sample sizes and extended follow-up durations to further confirm the long-term therapeutic benefits and safety profile of OsteoKing in LDH.

Conclusion

Oral administration of OsteoKing effectively alleviates pain, improves lumbar spine function, and reduces serum levels of inflammatory factors in LDH patients compared to momotherapy (Celecoxib). In addition, OsteoKing greatly enhanced patients' quality of life, with good safety and high patient satisfaction. Thus, OsteoKing is a safe, effective non-surgical option for the management of LDH, with significant clinical application value.

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Disclosure of conflict of interest

None.

Address correspondence to: Hongye Zhai, Department of Orthopedics and Traumatology, Jilin Academy of Chinese Medicine Sciences, No. 6426, Ziyou Road, Nanguan District, Changchun 130022, Jilin, China. Tel: +86-0431-86766366; E-mail: zkyzhaihongye@163.com

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