

Research Progress of Minimally Invasive Treatment for Lumbar Intervertebral Disc Herniation in Traditional Chinese and Western Medicine

Youbing Jian¹, Lei Wang^{2,*}, Wenjie Li¹, Zhanyi Hu¹

¹Shaanxi University of Chinese Medicine, Xianyang 712046, Shaanxi, China

²Affiliated Hospital of Shaanxi University of Chinese Medicine, Xianyang 712000, Shaanxi, China

*Correspondence Author

Abstract: *From the perspective of minimally invasive therapy in traditional Chinese and Western medicine, this paper collates and summarizes relevant literature on lumbar intervertebral disc herniation (LDH) in recent years and conducts a review, aiming to provide a basis for clinicians to select more scientific, rational and effective minimally invasive therapies based on the actual conditions of their hospitals and themselves.*

Keywords: Minimally Invasive, Lumbar Intervertebral Disc Herniation, Traditional Chinese and Western Medicine, Research Progress.

1. Introduction

Lumbar intervertebral disc herniation (LDH), also known as lumbar intervertebral disc fibrorupture with nucleus pulposus protrusion, is a common and frequently occurring disease in orthopedics. With age, the water content of the nucleus pulposus gradually decreases, elasticity declines, intervertebral space narrows, and surrounding ligaments relax—these constitute the internal causes of LDH, while acute injury or chronic strain serves as the external cause [1]. In recent years, with the rapid pace of work and lifestyle changes as well as the widespread application of the Internet, the incidence of LDH has been increasing year by year and tending to affect younger populations. Traditional surgery is often not the first choice due to factors such as anesthesia, underlying diseases, economic burden, trauma, postoperative complications and long-term outcomes, while conservative treatment yields unsatisfactory long-term effects. With the popularization of minimally invasive concepts and technologies, minimally invasive therapy has gained clinical attention for its advantages of minimal trauma, rapid recovery, few complications and minimal or no disruption to spinal stability. Therefore, minimally invasive therapy has gradually become the first choice for both patients and physicians. However, selecting the optimal minimally invasive therapy for individual patients remains an urgent clinical problem to be solved. This paper collates and summarizes recent literature on LDH from the perspective of traditional Chinese and Western minimally invasive therapy and conducts a review, aiming to provide a basis for clinicians to select more scientific, rational and effective minimally invasive therapies.

2. Minimally Invasive Therapy in Traditional Chinese Medicine

2.1 Small Needle Knife

The small needle knife can release adhesions, restore soft tissue balance and regulate spinal static balance. Meanwhile, it promotes the absorption of inflammatory substances and pathological products, improves local circulatory function, raises the pain threshold, reduces hyperalgesia and pain

transmission, thereby alleviating pain [2]. Jin Guoqiang et al. [3] treated 60 patients with LDH using the small needle knife. After 3 courses of treatment, the JOA score significantly increased, with an effective rate of 93.33%. This indicates that the small needle knife can significantly improve clinical symptoms of LDH patients with definite efficacy. Wu Xu and Li Wenxiong [4] treated 44 LDH patients with the small needle knife and evaluated its safety. After treatment, the VAS score significantly decreased, and the levels of IL-1 β and TNF- α were significantly lower than those before treatment, with a total effective rate of 95.5%. It suggests that the small needle knife is safe and effective, possibly by inhibiting the release of IL-1 β and TNF- α to improve lumbar function and pain symptoms. Mei Shengli [5] observed the efficacy of small needle knife combined with modified Duhuo Jisheng Decoction in treating 77 patients with acute LDH. The results showed that the ODI score significantly decreased, the JOA score significantly increased, and the total effective rate was 94.8%. In conclusion, as a minimally invasive therapy, the small needle knife has the advantages of minimal trauma, rapid recovery, low cost, high effective rate and definite efficacy. Visualization under the guidance of imaging technologies such as C-arm or CT can further improve its safety and effectiveness.

2.2 Water Needle Knife

The water needle knife integrates traditional Chinese medicine (TCM) syndrome differentiation and disease differentiation with Western medicine theories, combining multiple effects including injection, stimulation and needle knife therapy. Its mechanism involves both Western medicine theories of nerve conduction and humoral regulation and traditional meridian theory, integrating Chinese and Western medicine for comprehensive application [6]. Chen Xiaofeng et al. [7] treated 78 LDH patients with CT-guided targeted minimally invasive release using a water needle knife. One month of follow-up showed that the VAS score significantly decreased and the JOA score significantly increased compared with pre-treatment levels, with a total effective rate of 88.5% for pain relief and 89.8% for functional improvement. This indicates that the CT-guided water needle

knife is precise with definite efficacy. Liu Xiaofeng et al. [8] explored the efficacy of ultrasound-guided water needle knife for LDH. Forty LDH patients were randomly divided into an ultrasound-guided group and an empirical puncture group. Half a year of follow-up confirmed efficacy in both groups, but the ultrasound-guided group had significantly better total effective rate, VAS score and ODI index than the empirical group. In conclusion, the water needle knife releases local adhesions, improves local blood circulation and relieves nerve compression, while delivering drugs directly to the lesion site to unblock meridians, relax spasms and relieve pain [9]. Combined with B-ultrasound or CT guidance, it enhances accuracy and safety for optimal outcomes.

2.3 Blade Needle

The blade needle is a characteristic minimally invasive therapy in TCM developed on the basis of traditional acupuncture, incorporating myology, biomechanics and anatomy [10]. Its mechanism involves releasing tense muscles via cutting and puncturing, relieving vascular and nerve compression, maintaining biomechanical balance, thereby improving pain and functional limitation in patients [11]. Du Shuaigang et al. [12] treated 35 LDH patients with the blade needle. Three months of follow-up showed significantly increased JOA score, significantly decreased VAS score and ODI index, and reduced levels of laboratory indicators IL-6 and CRP. It is believed that the blade needle therapy integrates the effects of "acupuncture, thread and knife", with the dual effects of unblocking meridians, regulating qi and blood, as well as releasing adhesions and relieving compression.

2.4 Floating Acupuncture

Invented by Professor Fu Zhonghua in 1996, floating acupuncture has the advantages of wide indications, rapid efficacy and convenient operation. It involves scanning the superficial fascia layer around the lesion combined with active patient movement. Its mechanism includes TCM cutaneous region theory, local therapeutic principle, pain as acupoint, low-resistance meridian channels, tissue channels and fascia science [13]. Peng Guoran [14] treated 40 LDH patients with floating acupuncture and found it effectively relieved clinical symptoms, with efficacy not improving with prolonged treatment courses. Duan Yunqing et al. [15] selected 56 LDH patients who failed 5 sessions of conventional acupuncture, massage and external application of traditional Chinese medicine. After 10 sessions of floating acupuncture, the total effective rate was 92.86%. Huang Saizhi [16] compared the efficacy of floating acupuncture and conventional acupuncture for LDH, finding significantly better outcomes in the floating acupuncture group with a total effective rate of 96.08%. In conclusion, floating acupuncture achieves rapid and remarkable efficacy for LDH and is worthy of clinical application.

2.5 Acupoint Catgut Embedding

Acupoint catgut embedding involves implanting degradable threads into relevant acupoints for long-term sustained stimulation, exerting benign regulatory effects of unblocking meridians and promoting qi and blood circulation, thereby

improving local blood circulation, promoting the production of macrophages and antibodies, and enhancing immunity [17-18]. Xing Wujun et al. [19] treated 300 LDH patients with catgut embedding at umbilical four trigrams and lumbar Jiaji acupoints. Compared with pre-treatment levels, the VAS score significantly decreased, and the motor amplitudes of the common peroneal nerve and tibial nerve significantly increased, indicating that acupoint catgut embedding not only relieves clinical symptoms of LDH but also promotes the recovery of lower limb nerve function. Cheng Shizhong [20] compared the efficacy of acupoint catgut embedding and conventional acupuncture for LDH by evaluating VAS score, JOA score and total effective rate. The results showed significantly better clinical outcomes with acupoint catgut embedding, especially in relieving pain and improving lumbar function, with greater convenience and time efficiency. Feng Hua et al. [21] compared redness, induration and tenderness at embedding sites with polydioxanone (PDS) thread and catgut, and assessed efficacy using the Neck Disability Index (NDI). The results showed significantly fewer adverse reactions with PDS thread, with no significant difference in NDI score. This suggests that safety is a prerequisite for acupoint catgut embedding, and materials should be carefully selected.

3. Minimally Invasive Therapy in Western Medicine

3.1 Ozone Nucleus Pulposus Ablation

Ozone nucleus pulposus ablation involves injecting medical ozone into the intervertebral disc to oxidize the nucleus pulposus, reduce its volume and relieve mechanical compression of nerve roots. As a strong oxidant, ozone also has significant analgesic and anti-inflammatory effects [22]. Wei Zhenggang et al. [23] randomly divided 320 LDH patients into an ozone ablation group and a conventional drug group. Both groups achieved efficacy, but the ozone ablation group had significantly better total effective rate, JOA score and VAS score, confirming remarkable efficacy of ozone ablation. Zhou Zhou and Hu Hua [24] observed the safety and efficacy of repeated ozone ablation in 20 LDH patients. No nerve injury or cardiovascular and cerebrovascular accidents occurred intraoperatively. Half a year of average follow-up showed no postoperative infection, with an excellent and good rate of 90% and significantly reduced VAS score. Wu Junxiao et al. [25] evaluated the long-term efficacy of ozone nucleus pulposus ablation for LDH. Ten years of follow-up showed significantly improved low back pain score and a total effective rate of 73.1%, confirming definite and durable long-term efficacy of ozone nucleus pulposus ablation for LDH.

3.2 Collagenase Chemonucleolysis

Collagenase chemonucleolysis involves injecting collagenase into the responsible intervertebral disc or around the herniated tissue to denature collagen molecules, thereby reducing or eliminating compression of nerve tissues by the herniated mass and relieving clinical symptoms [26]. Bo Cunju et al. [27] treated 36 patients with prolapsed LDH using pump-injected collagenase. Three months of postoperative follow-up showed an excellent and good rate of 91.6%, and lumbar magnetic resonance imaging (MRI) confirmed significant reduction of

the herniated mass, indicating definite efficacy. Hou Junkui et al. [28] compared CT-guided and empirical non-CT-guided collagenase injection in 72 LDH patients. The CT-guided group had significantly better excellent and good rate, one-time puncture success rate and postoperative VAS score, confirming that CT guidance ensures accurate delivery of collagenase to the lesion site, embodying minimally invasive, precise and targeted principles.

3.3 Low-Temperature Plasma Nucleus Pulposus Ablation

Low-temperature plasma nucleus pulposus ablation involves ablating and vaporizing nucleus pulposus tissue within the intervertebral disc to reduce intradiscal pressure, relieve mechanical compression of nerve roots and alleviate pain [29]. Wang Fei et al. [30] treated 160 LDH patients with low-temperature plasma nucleus pulposus ablation. Three months of postoperative follow-up showed significantly reduced VAS score with an effective rate of 86.25%. Yuan Xiaohong et al. [31] treated 138 LDH patients with this ablation therapy. One year of postoperative follow-up showed significantly reduced VAS score and significantly increased JOA score, confirming definite efficacy worthy of clinical promotion. Gu Haichao et al. [32] treated 38 LDH patients with this ablation therapy. Eleven months of average follow-up showed VAS score decreased from preoperative 6.85 ± 1.25 to 1.68 ± 0.50 , with an excellent and good rate of 84.21% evaluated by modified MacNab criteria, confirming significant symptom relief and favorable mid-term outcomes.

3.4 Radiofrequency Thermocoagulation

Radiofrequency thermocoagulation targets the herniated intervertebral disc. Its principle involves vaporizing or thermocoagulating nucleus pulposus tissue via radiofrequency electrodes in a short time, improving blood circulation, reducing inflammatory response, lowering intradiscal pressure and relieving nerve compression [33]. Yu Yanbo et al. [34] compared the efficacy of radiofrequency thermocoagulation and conservative treatment for LDH. Three, six and twelve months of postoperative follow-up confirmed efficacy in both groups, but the radiofrequency group had significantly better VAS score and excellent and good rate at all time points, with the excellent and good rate rising to 90%. Chen Zhenxiong [35] treated 102 LDH patients with radiofrequency thermocoagulation, achieving an excellent and good rate of 85.2% with definite efficacy. No complications such as spinal cord injury or spinal canal infection occurred intraoperatively or postoperatively, confirming radiofrequency thermocoagulation as a safe and effective therapy.

3.5 Percutaneous Laser Disc Decompression

The therapeutic mechanism of laser involves two main aspects: first, thermal effects achieve anti-inflammatory analgesia and improve microcirculation; second, partial vaporization and ablation of the nucleus pulposus reduce intradiscal pressure and relieve compression of nerve roots or spinal cord [36-37]. Meng Yu et al. [38] compared the clinical efficacy of percutaneous laser disc decompression and traditional open surgery for LDH. Both methods achieved efficacy, but the laser group had advantages of minimal

trauma, rapid recovery, low cost and short hospital stay. Su Yin et al. [39] evaluated the efficacy of zonal vaporization decompression via percutaneous laser disc decompression. The responsible intervertebral disc was divided into nucleus pulposus zone (A zone), intervertebral foramen zone (B zone) and entry point zone (C zone). Twenty-two point two ± 4.2 months of average follow-up showed significantly better excellent and good rate in the zonal decompression group than in the single-zone group, confirming zonal decompression as a novel approach for LDH treatment.

3.6 Percutaneous Transforaminal Endoscopic Technique

The percutaneous transforaminal endoscopic technique involves placing a specialized working cannula directly at the site of intervertebral disc herniation, removing the disc under direct visualization and relieving nerve root compression. Li Dong et al. [40] compared the surgical efficacy of percutaneous transforaminal endoscopic technique and microendoscopic discectomy for LDH. Twenty-two months of average follow-up confirmed significant efficacy in both groups, but the transforaminal endoscopic group had significantly better incision length, blood loss and hospital stay. Chen Huiping [41] evaluated the clinical efficacy of percutaneous transforaminal endoscopic technique and traditional open surgery, finding significantly better VAS score, JOA score, Quality of Life Questionnaire Core 30 (QOL-C30) score, excellent and good rate, incision length, intraoperative blood loss and hospital stay in the transforaminal endoscopic group at all time points. This confirms that the percutaneous transforaminal endoscopic technique has the advantages of minimal trauma, less blood loss and short hospital stay.

4. Problems and Prospects

Review of the literature reveals that minimally invasive therapy in both traditional Chinese and Western medicine relieves mechanical compression of nerve roots by releasing adhesions, improving circulation, raising pain threshold, reducing hyperalgesia and pain transmission, shrinking the nucleus pulposus and lowering intradiscal pressure, combined with absorption of inflammatory substances, to achieve the effects of unblocking meridians, regulating qi and blood, relaxing spasms and relieving pain. Secondly, minimally invasive therapy in traditional Chinese and Western medicine for LDH has the advantages of remarkable efficacy, minimal trauma and rapid recovery, but it also faces several problems requiring further reflection and summary:

- 1) Minimally invasive technology represents an inevitable trend in medical development, gaining increasing attention from patients and physicians for minimal trauma and rapid rehabilitation. However, it should be clearly recognized that traditional open surgery cannot be completely replaced by minimally invasive therapy, nor can it solve all clinical problems.
- 2) Exaggerating the advantages of minimally invasive technology leads to excessive patient expectations, straining doctor-patient relationships.
- 3) Novice surgeons may experience higher complication rates

with minimally invasive therapy than with traditional open surgery in the early learning curve.

4) In economically underdeveloped regions, the popularization and application of minimally invasive surgery are limited by inadequate hardware and shortage of skilled personnel.

5) The pathogenesis of LDH remains unclear, and there is no standardized and stepwise treatment protocol.

6) A wide variety of minimally invasive therapies exist with distinct characteristics, some of which lack rigorous protocols and rational statistical methods, potentially affecting literature quality.

7) Inadequate understanding of minimally invasive therapy and inaccurate indication selection result in delayed treatment for LDH patients suitable for minimally invasive intervention. Therefore, it is necessary to widely promote and clarify the indications of each minimally invasive therapy.

8) There are no standardized criteria for recurrence assessment. To further evaluate the clinical efficacy of minimally invasive therapy for LDH, unified standards and evaluation systems, as well as more scientific, rigorous protocols and evidence-based medicine, should guide clinical practice, which is of profound significance for minimally invasive therapy of LDH.

9) Basic research on minimally invasive therapy remains insufficient. Therefore, conducting more experimental studies to explore its mechanism and consolidate theoretical foundations is a shared goal to guide clinical practice more scientifically, rationally and effectively.

References

- [1] Wang HM, Huang GC. Traditional Chinese Medicine Orthopedics and Traumatology [M]. Beijing: China Press of Traditional Chinese Medicine, 2012:322-327.
- [2] Zhang LQ, Yan WP, Qiang TM, et al. Research Progress of Acupuncture Knife in the Treatment of Lumbar Intervertebral Disc Herniation [J]. World Latest Medicine Information, 2019,19(99):145-146.
- [3] Jin GQ, Zhu Y, Li JS, et al. Clinical Observation of Acupuncture Knife in the Treatment of Lumbar Intervertebral Disc Herniation [J]. Chinese Journal of Folk Therapies, 2020,28(02):25-27.
- [4] Wu X, Li WX. A Randomized Controlled Trial of Small Needle Knife in the Treatment of Lumbar Intervertebral Disc Herniation [J]. Western Journal of Traditional Chinese Medicine, 2018,31(12):125-127.
- [5] Mei SL. Clinical Efficacy Observation of Small Needle Knife Combined with Modified Duhuo Jisheng Decoction in the Treatment of Acute Lumbar Intervertebral Disc Herniation [J]. Journal of Practical Traditional Chinese Medicine, 2020,36(02):147-148.
- [6] Wang SJ, Zhang XC, Wang SM, et al. Current Status of Minimally Invasive Therapy in Traditional Chinese Medicine for Cervical Spondylotic Radiculopathy [J]. Chinese Journal of Integrated Traditional and Western Medicine, 2016,11(10):1470-1472.
- [7] Chen XF, Cao Y, Pu JF, et al. Application of CT-Guided Targeted Minimally Invasive Release with Water Needle Knife in the Treatment of Lumbar Intervertebral Disc Herniation [J]. Journal of Interventional Radiology, 2019,28(08):754-758.
- [8] Liu XF, Wu YH, Wang HM, et al. Clinical Study of Ultrasound-Guided Water Needle Knife in the Treatment of Lumbar Intervertebral Disc Herniation [J]. Journal of Shandong University of Traditional Chinese Medicine, 2017,41(04):341-344.
- [9] Zhao MM, Liu FX, Hong T, et al. Systematic Evaluation of Acupuncture Knife in the Treatment of Cervical Spondylotic Radiculopathy [J]. Chinese Journal of Traditional Chinese Medicine Communication, 2016, 15(04): 40-42+45.
- [10] Ke WM, Zhou XH, Lü JB, et al. Clinical Observation of Blade Needle Combined with Long's Manipulation in the Treatment of 66 Cases of Cervical Spondylotic Radiculopathy [J]. Hunan Journal of Traditional Chinese Medicine, 2018,34(06):91-92.
- [11] Zhu ZX. Clinical Efficacy of Spinal Manipulation Combined with Acupuncture Knife in the Treatment of 40 Cases of Cervical Spondylotic Radiculopathy [J]. Chinese Community Doctors, 2015,31(01):92-93.
- [12] Du SG, Wang XC, Zhou SL, et al. Clinical Study of Arc Blade Needle Comprehensive Therapy in the Treatment of Lumbar Intervertebral Disc Herniation [J]. Chinese Journal of Integrated Traditional and Western Medicine, 2019,39(02):194-199.
- [13] Tao JL, Fu ZH, Zhang HR. Brief Analysis of the Mechanism of Floating Acupuncture Therapy [J]. Lishizhen Medicine and Materia Medica Research, 2014,25(12):3006-3008.
- [14] Peng GR. 40 Cases of Lumbar Intervertebral Disc Herniation with Low Back and Leg Pain Treated by Floating Acupuncture [J]. Chinese Journal of Folk Therapies, 2018,26(02):19-20.
- [15] Duan YQ, Yan DF, Li WL, et al. 56 Cases of Lumbar Intervertebral Disc Herniation Treated by Floating Acupuncture [J]. Journal of Practical Traditional Chinese Medicine, 2018,34(05):612-613.
- [16] Huang SZ. Efficacy Observation of Floating Acupuncture in the Treatment of 51 Cases of Lumbar Intervertebral Disc Herniation [J]. Hunan Journal of Traditional Chinese Medicine, 2015,31(06):89-90.
- [17] Zhang JY, Yao WN, Fan Y, et al. Clinical Efficacy Observation of Local Acupuncture in the Treatment of Cervical Spondylosis [J]. Sichuan Journal of Traditional Chinese Medicine, 2018,36(05):187-190.
- [18] Luo Y, Li BR, Cao YQ, et al. Efficacy Observation of Acupoint Catgut Embedding Combined with Polarized Light Irradiation in the Treatment of 98 Cases of Cervical Spondylotic Radiculopathy [J]. Medical Journal of National Defending Forces in Northwest China, 2016,37(02):122-123.
- [19] Xing WJ, Ma YK, Ji Z, et al. Clinical Observation of Acupoint Catgut Embedding in the Treatment of Lumbar Intervertebral Disc Herniation [J]. China Medical Innovation, 2019,16(34):85-89.
- [20] Cheng SZ. Clinical Analysis of Acupoint Catgut Embedding in the Treatment of Lumbar Intervertebral Disc Herniation [J]. Journal of Practical Traditional Chinese Medicine, 2018,34(07):841-842.

- [21] Feng H, Ding M, Jiang YQ, et al. Efficacy and Safety of Minimally Invasive Catgut Embedding Therapy in the Treatment of Cervical Spondylotic Radiculopathy [J]. *Jiangsu Journal of Traditional Chinese Medicine*, 2012,44(12):59-60.
- [22] Lian AQ, Wu XB. Logistic Regression Analysis of Risk Factors for Early Recurrence After Ozone Ablation for Lumbar Intervertebral Disc Herniation [J]. *Journal of Cervicodynia and Lumbodysnia*, 2017,38(05):470-473.
- [23] Wei ZG, Zhao L, Song M, et al. Clinical Efficacy of Ozone Ablation in the Treatment of Lumbar Intervertebral Disc Herniation [J]. *Gansu Medical Journal*, 2016,35(08):588-590.
- [24] Zhou Z, Hu H. Repeated Percutaneous Target Puncture Ozone Ablation for Lumbar Intervertebral Disc Herniation [J]. *Chinese Journal of Bone and Joint Injury*, 2016, 31(03):299-300.
- [25] Wu JX, Zhang YY, Chen XL. Long-Term Efficacy Observation of Ozone Nucleus Pulposus Ablation in the Treatment of Lumbar Intervertebral Disc Herniation [J]. *Journal of Community Medicine*, 2019, 17(22): 1442-1444.
- [26] Qiu MZ, Wan Q, Zhang DY. Research Progress of Collagenase Chemonucleolysis in the Treatment of Lumbar Intervertebral Disc Herniation [J]. *Shanghai Medical & Pharmaceutical Journal*, 2016,37(17):5-9.
- [27] Bo CJ, Lu ZH, Chen JS, et al. Clinical Study of Extradiscal Pump-Injected Collagenase in the Treatment of Prolapsed Lumbar Intervertebral Disc Herniation [J]. *Chinese Journal of Pain Medicine*, 2014, 20(09): 646-649.
- [28] Hou JK, Yang CB, Lin YB, et al. CT-Guided Target Injection of Collagenase for Lumbar Intervertebral Disc Herniation: A Report of 36 Cases [J]. *China Pharmaceuticals*, 2014,23(21):98-99.
- [29] He PY, Zhang SJ, Qi F. Clinical Study of Low-Temperature Plasma Nucleus Pulposus Ablation Combined with Lumbar Traction in the Treatment of Discogenic Low Back Pain [J]. *Journal of Clinical and Experimental Medicine*, 2016,15(14):1417-1419.
- [30] Wang F, Wang D, Wang QB. Clinical Efficacy of Low-Temperature Plasma Nucleus Pulposus Ablation in the Treatment of Lumbar Intervertebral Disc Herniation [J]. *Zhejiang Medical Journal*, 2017,39(12):1011-1013.
- [31] Yuan XH, Li PY, Ye C, et al. Clinical Efficacy Observation of Low-Temperature Plasma Nucleus Pulposus Ablation in the Treatment of Lumbar Intervertebral Disc Herniation [J]. *Journal of Cervicodynia and Lumbodysnia*, 2016,37(06):547-549.
- [32] Gu HC, Tang ZJ, Ye GY, et al. Percutaneous Low-Temperature Plasma Nucleus Pulposus Ablation for Lumbar Intervertebral Disc Herniation [J]. *China Medicine and Pharmacy*, 2014,4(22):195-197.
- [33] Guo S, Wang G, Yang K, et al. Clinical Observation of Target Radiofrequency Thermocoagulation Combined with Internal Heating Acupuncture in the Treatment of Mixed Low Back and Leg Pain [J]. *Chinese Journal of Emergency in Traditional Chinese Medicine*, 2018, 27(10): 1794-1797.
- [34] Yu YB, Zhang DY, Wang ZJ, et al. Clinical Efficacy Observation of Target Radiofrequency Thermocoagulation in the Treatment of Adolescent Lumbar Intervertebral Disc Herniation [J]. *Contemporary Medicine*, 2015,21(35):19-20.
- [35] Chen ZX. Target Radiofrequency Thermocoagulation for Lumbar Intervertebral Disc Herniation: A Report of 102 Cases [J]. *Journal of Xianning University (Medical Edition)*, 2011,25(06):515-516.
- [36] Dai B, Hao DQ, Zhang H, et al. Efficacy Evaluation of Percutaneous Laser Disc Decompression in the Treatment of Cervical Spondylotic Radiculopathy [J]. *Chinese Journal of Practical Nervous Diseases*, 2014, 17(21): 20-22.
- [37] Luo P, Liu L. Clinical Efficacy of Percutaneous Laser Vaporization Decompression in the Treatment of Cervical Spondylotic Radiculopathy [J]. *Medical Equipment*, 2019,32(12):67-68.
- [38] Meng Y, Zhao JR, Zhu HP. Percutaneous Laser Vaporization Decompression vs. Traditional Open Surgery for Lumbar Intervertebral Disc Herniation [J]. *Journal of Lanzhou University (Medical Edition)*, 2014, 40(01): 41-44.
- [39] Su Y, Li R, Xing HQ, et al. Efficacy Analysis of Zonal Decompression via Percutaneous Laser Disc Decompression for Lumbar Intervertebral Disc Herniation [J]. *Chinese Journal of Traditional Medical Traumatology & Orthopedics*, 2013,21(10):31-33.
- [40] Li D, Chang ZY, Cai P, et al. Comparison of Percutaneous Transforaminal Endoscopic Technique and Microendoscopic Discectomy for Lumbar Intervertebral Disc Herniation [J]. *Chinese Journal of Bone and Joint Injury*, 2018,33(09):921-924.
- [41] Chen HP. Short-Term Efficacy Comparison of Percutaneous Transforaminal Endoscopic Discectomy and Laminectomy Discectomy for Elderly Lumbar Intervertebral Disc Herniation [J]. *Journal of Cervicodynia and Lumbodysnia*, 2018,39(04):522-523.