

# CT-guided drug injection around the nerve root to treat lumbar disc herniation

Xiaowei Sun, Guangyue Xie, Yuexin Wang, Guanhua Liu, Shichao Li and Xiaohua Hou\*

First Orthopedics Department of Tangshan Gongren Hospital, Tangshan, China

**Abstract:** To observe and analyze the effect of CT-guided drug injection around the nerve root in the treatment of lumbar disc herniation, the 140 patients diagnosed with lumbar disc herniation in our hospital, were selected as the study subjects for CT-guided drug injection around the nerve root and treatment efficacy was observed. According to the modified Mac Nab criteria, there were 80 cases, 50 cases, 6 cases, and 4 cases of excellent, good, fair, and poor results, with excellent and good rate at 92.86%; the patients whose onset time was less than three months and more than three months were compared in terms of VAS scores before and after surgery. The results showed that the postoperative pain score was significantly lower in patients whose onset time was less than three months compared to those whose onset time was more than three months,  $P < 0.05$ ; observation of patients' quality of life before and after treatment shows great improvement in quality of life after treatment,  $P < 0.05$ . The treatment of lumbar disc herniation with CT-guided drug injection around the nerve root can achieve relatively good results with significantly improved therapeutic effect and great application value.

**Keywords:** CT-guided, accurate positioning, nerve root, peripheral drug injection, lumbar disc herniation.

## INTRODUCTION

Lumbar disc herniation is already a common orthopedic disease. The main cause is that the lumbar intervertebral disc including the nucleus pulposus, annulus fibrosus, and cartilaginous plates, nucleus pulposus in particular, show different degrees of degenerative changes, leading to annulus fibrosus ruptures under the influence of external forces, then nucleus pulposus protrudes from the rupture to the posterior or spinal canal, causing stimulation or oppression in adjacent spinal nerve roots (Liu *et al.*, 2010, Yuan *et al.*, 2013, Zhang and Zheng 2013, Chuanlei *et al.*, 2018). The main clinical symptoms of lumbar disc herniation are low back pain, numbness and pain in one or both lower extremities, which seriously affect people's normal quality of life.

The diagnosis of typical cases is usually not difficult by combining medical history, physical examination, and imaging examination, especially at today when CT and magnetic resonance techniques are widely used. The treatment of lumbar disc herniation involves non-surgical treatment, surgical treatment and non-vascular interventional therapy. Collagenase or ozone injection, percutaneous excision and aspiration, percutaneous laser decompression, etc. are non-vascular interventional treatment programs. Each therapy has different indications, and produces different effects. This study is to observe and explore the effect of CT-guided drug injection around the nerve root in lumbar disc herniation treatment.

## MATERIALS AND METHODS

The 140 patients with lumbar disc herniation treated in our hospital from January 2015 to December 2017 were selected for the study. Among the 140 patients, there were 75 male patients and 65 female patients, the oldest was 78 years old and the youngest was 20 years old, with an average age of  $(50.6 \pm 10.2)$  years. This paper has a rigorous structure, and the conclusion has been approved by relevant ethics and relevant departments. Where, onset time of 72 patients was within three months, while that of the remaining 68 patients was beyond three months. CT or MRI examination shows there are respectively 20 cases, 62 cases and 40 cases with incidence segments at L3, 4, L4, 5, L5S1 and 18 cases involve both L4, 5 and L5S1. All the patients have signed the formal informed consent. The patients have good communication skills and there is no one with mental disorders. The Imaging examination picture of lumbar disc herniation is shown in fig. 1.

All the patients received CT-guided drug injection around the nerve root. First, CT scan was performed to scientifically determine lumbar disc herniation and then the feed point was determined according to anatomical structure of the intervertebral foramen and nerve root direction. Reasonable measurement was made for the distance and angle between the entry point and intervertebral foramen nerve root (Alvi *et al.*, 2017). The patients were sterilized closely and subjected to local anesthesia. The PTC needle puncture was performed in the corresponding intervertebral foramen by following the measured angle and depth. The mixture of diprosan, normal saline, *Salvia miltiorrhiza*, iohexol, omnipaque was injected at a dose of 2ml, 5ml, 10ml, 2 ml and 1 ml

\*Corresponding author: e-mail: houxiaohua@medmail.com.cn

respectively. CT scan was performed closely to determine exactly whether successful injection effect has been achieved. If the injection is successful, the symptoms of low back and leg pain can be reproduced or aggravated during the injection, and the drug is infiltrated at the nerve root to reach spinal epidural part.

The patients' excellent and good rate of treatment is evaluated according to the modified Mac Nab criteria including excellent, good, fair, and poor criteria (Cheolwoong *et al.*, 2016; Ali *et al.*, 2017). Where, the excellent criterion is that patient resumes work ability after treatment, has occasional low back or leg pain, does not rely on pain killer, has good physical agility and has no signs of nerve root damage (Zheng *et al.*, 2017); the good criterion is that patient basically resumes work ability, has intermittent mild low back pain or radiating pain, has no dependence on pain killer, has good physical agility and has no signs of nerve root damage; the fair criterion is that patients resumes work ability to some extent after treatment, needs pain killer, has limited physical activity; the poor criterion is that patient has no work ability, continues to suffer from pain, cannot stop the use of pain killer, has limited physical activity with positive nerve root injury signs. The patients' physiological, psychological, social and overall quality of life scores before and after treatment were counted using health status questionnaire (SF-36). In addition, patients' low back and leg pain status was evaluated by VAS (Visual Analogue Scale) score.

## STATISTICAL ANALYSIS

The statistical analysis software used was SPSS 21.0. Where, the measurement data were expressed as mean  $\pm$  average ( $\bar{x} \pm s$ ) and t was used for comparison between groups; the count data was expressed using natural number (n) and percentage (%) and chi-square was used for comparison between groups.  $P < 0.05$  indicates statistical value.

## RESULTS

### *Statistics of excellent and good rate of treatment*

According to table 1, the modified Mac Nab criteria shows there are 80 cases, 50 cases, 6 cases and 4 cases with excellent, good, fair, and poor results respectively, and the excellent and good rate is 92.86%. After 3 months of treatment, MRI shows significant alleviation in protruding intervertebral disc and the herniated disc disappears after 1 year of treatment.

### *VAS scores of low back and leg pain recovery*

Among the 140 patients, 72 patients have onset time of less than three months and are classified as group A; the other 68 patients have onset time of more than three

months and are classified as group B. VAS scores are counted for both groups before surgery, 1 week after surgery, 8 weeks after surgery. The results show that VAS score improvement is more significant in group A than in group B,  $P < 0.05$ , with statistics meaning. Statistics is shown in table 2.



**Fig. 1:** Imaging examination picture of lumbar disc herniation.



**Fig. 2:** MRI results of patients with lumbar disc herniation before treatment (a) and 1 year after treatment (b).

### *Comparison of patients' quality of life scores*

As shown in table 3 below, statistics of the patients' quality of life scores before and after treatment show that physiological function scores, psychological function scores, social function scores and overall quality of life scores are significantly improved after treatment,  $P < 0.05$ , statistically significant.

The MRI findings of 1 patient after 1 year of treatment are shown in fig. 2.

## DISCUSSION

The main cause of low back and leg pain is lumbar disc herniation. An important way to treat the disease is minimally invasive surgery. Where, treatment of lumbar

**Table 1:** Statistics of excellent and good rate of treatment [n(%)]

Case number	Excellent	Good	Fair	Poor	Excellent and good rate (%)
140	80	50	6	4	130(92.86)

**Table 2:** VAS scores of low back and leg pain recovery ( $\bar{x} \pm s$ )

Group	Case number	Before surgery	1 week after surgery	8 weeks after surgery
Group A	72	8.3±1.5	1.5±1.1	1.6±1.2
Group B	68	8.0±1.9	3.3±1.2	3.6±1.5
t		0.24	10.22	9.37
P		>0.05	<0.05	<0.05

**Table 3:** Comparison of quality of life scores before and after treatment ( $\bar{x} \pm s$ )

Time	Case number	Physiological function	Psychological function	Social function	Overall quality of life
Before treatment	140	0.97±0.32	1.30±0.52	1.29±0.15	4.81±0.55
After treatment	140	0.43±0.29	1.01±0.05	0.82±0.23	3.26±1.20
t		3.58	5.31	5.09	8.36
P		<0.05	<0.05	<0.05	<0.05

disc herniation by CT-guided drug injection around the nerve root has good safety and reliability and features easy operation, thus more easily accepted by the majority of patients (Matthew *et al.*, 2017; Naeem *et al.*, 2017). However, whether indications are accurately selected and positioned can exert a certain impact on the treatment efficacy. After detailed analysis, many scholars believe that important factors causing low back and leg pain should be clearly identified before CT-guided drug injection around the nerve root and that only when it is clearly determined that the low back and leg pain is caused by radicular neuritis as result of stimulation of the nerve root by lumbar disc herniation can this approach be regarded as the best treatment measure (Yuan and Du 2014, Cao 2012; Mushtaq *et al.*, 2017). However, this treatment plan is not recommended for discogenic low back pain caused by degeneration of the intervertebral disc with complete annulus fibrosus, so as to avoid deviations during positioning and puncture which will reduce efficacy and even produce serious complications that hinder the treatment (Xie *et al.*, 2016, Chao and Tan 2017, D'Souza and Rahaman 2018). After accurate positioning of the CT, detailed observation should be made on local anatomical structure and state of pathological changes of herniated disc, followed by scientific determination of puncture path to ensure puncture is performed around the nerve root involved in the lesion, as shown in fig. 3. After the drug injection, the patient needs to maintain prone position for 2 hours, so that the drug penetrates to the surroundings along the nerve roots with efficacy fully displayed. In this study, all patients had no vascular nerve injury during the puncture, 100% puncture success rate was achieved, and CT examination showed that the drug was injected around the

affected nerve roots and diffused to spinal epidural part along the nerve roots, with ideal effect obtained.

Therefore, minimally invasive interventional therapy should be performed as soon as possible once lumbar disc herniation is clinically diagnosed and CT-guided drug injection around the nerve root should be the preferred method. This study showed that the overall excellent and good rate of treatment was 92.86% among the 140 patients. Observation of quality of life before and after treatment reveals significant improvement in quality of life after treatment,  $P < 0.05$ , demonstrating obvious effect of the treatment.

## CONCLUSION

In summary, treatment of lumbar disc herniation with CT-guided drug injection around the nerve root can achieve relatively good results, significantly improve the treatment effect, and thus worthy of extensive practices.

## REFERENCES

- Ali W, Habib M, Sajid S, Khan RSA, Zia MA, Khan IU, Javed A, Muzammil HM, Mazhar MU, Farooq M and Shah Masud (2017). Comparison and evaluation of one-step reverse transcriptase-polymerase chain reaction (Rt-Pcr) and reverse transcriptase loop-mediated isothermal amplification assay (Rt-Lamp) for rapid detection of foot-and-mouth disease virus (Fmdv). *Matrix Science Medica*, **1**(2): 16-19.
- Alvi MA, Saqib M, Ashfaq K, Rashid I, Tayyab MH and Ijaz MU (2017). Significance of antioxidants in maintaining dairy and beef animals' health. *Matrix*

- Science Medica*, **1**(02): 11-12.
- Cao Y (2012). CT-guided percutaneous laser disc decompression combined with ozone in lumbar disc herniation treatment. *Chinese Imaging Journal of Integrated Traditional and Western Medicine*, **10**(04): 353-354.
- Chao TM and Tan AH (2017). DLC deposition parameters optimization for head disk design interface with a thermal protrusion slider from tribological point of view. *Materials Design*, **48**(6): 58-67.
- Cheolwoong P, Changgi K and Young C (2016). Effect of spark plug protrusion on the performance and emission characteristics of an engine fueled by hydrogen-natural gas blends. *Journal of Mechanical Science and Technology*, **28**(4): 1539-1544.
- Chuanlei L, Yuanfei H and Guomin L (2018). Study on the relation between self consistency and congruence and mental health of postgraduates. *Matrix Science Medica*, **2**(01): 01-03.
- D'Souza UJA and Rahaman MS (2018). Stress, psychological, somatic, isolation, restraint, rodent. *Matrix Science Pharma*, **2**(01): 03-05.
- Liu YZ, Xu JH, Xu Q, Ni DX, Wang WZ, Qu LH and Zhou HL (2010). CT-guided drug injection around the nerve root to treat lumbar disc herniation. *Chinese Journal of Bone and Joint Injury*, **25**(02): 137-138.
- Matthew M Miller, Stefanie Lapetina, Stacey M Mac Grath, Mindan K Sfakianos, Thomas D Pollard and Anthony J Koleske (2010). Regulation of Actin Polymerization and Adhesion-Dependent Cell Edge Protrusion by the Abl-Related Gene (Arg) Tyrosine Kinase and N-WASp. *Biochemistry*, **49**(10): 2227-2234.
- Mushtaq A, Khaliq T, Sher HA, Farid A, Kanwal A and Sarfraz M (2017). Pharmacokinetic study of clarithromycin in human female of Pakistani population. *Matrix Science Pharma*, **1**(02): 13-16.
- Naeem M, Ishtiaq A and Naz S (2017). Influence of dietary protein on proximate composition of *Mori, Cirrhinus mrigala* (Hamilton). *Matrix Science Pharma*, **1**(02): 1-5.
- Xie J, Wei F and Zheng JH (2016). 3D laser investigation on micron-scale grain protrusion topography of truncated diamond grinding wheel for precision grinding performance. *International Journal of Machine Tools Manufacture: Design, research and application*, **51**(5): 411-419.
- Yuan HJ and Du CY (2014). Method selection and efficacy observation of CT-guided radiofrequency thermo coagulation + ozone ablation in lumbar disc herniation treatment. *Nei Mongol Journal of Traditional Chinese Medicine*, **33**(12): 72-73.
- Yuan HJ, Du CY, Hu GX and Li YB (2013). CT-guided ozone ablation technique combined with collagenase dissolution to treat lumbar disc herniation. *Jilin Medical Journal*, **34**(05): 880-882.
- Zhang CZ and Zheng B (2013). Analysis of efficacy of CT-guided transcatheter drug intervention therapy in lumbar disc herniation treatment. *Harbin Medical Journal*, **33**(01): 41.
- Zheng DD, Zhang PY and Xu TS (2017). Study of acoustic transducer protrusion and recess effects on ultrasonic flow meter measurement by numerical simulation. *Flow Measurement and Instrumentation*, **22**(5): 488-493.