Anatomical Basis of Acupotomy for Pain Treatment under Ultrasound Guidance

Wei Huang

Kunming Medical University Haiyuan College, Kunming, Yunnan, 650000, China

Keywords: Ultrasound Guidance, Needle Knife, Chronic Neck Pain, Anatomy

Abstract: objective: to study the therapeutic effects of ultrasound-guided needle knife intervention, nerve block and drug therapy on chronic cervical pain based on anatomical basis. Methods: 120 patients (aged 60 and above) were randomly divided into needle knife intervention group (n = 40), nerve block group (n = 40) and drug control group (n = 40). Results: the odi score did not improve in 5 patients one year after operation, with a total effective rate of 87.5%. The vas score did not change in 7 patients 10 min after operation, with a total effective rate of 77.50%. No complications occurred. The difference was statistically significant ($p < 0.05$). Conclusion: the therapeutic effect of acupotomy guided by ultrasound on chronic neck pain is better, especially in the long term.

1. Introduction

The incidence rate of spine-related pain is relatively high in chronic pain, of which cervical spine and lumbar spine are common [1]. Chronic neck pain refers to a kind of disease with neck and shoulder pain or combined symptoms such as upper extremity pain and numbness occurring for more than 6 months. In recent years, with the change of people's life and work style, the number of bowing heads is increasing day by day, making the incidence of chronic neck pain rise significantly. In the united states, chronic neck pain and low back pain are the second leading causes of disability, spending more than $50 billion per year on treatment [2]. Needle-knife therapy has certain therapeutic advantages for this disease, but due to the complex pathogenesis of this disease, needle-knife release treatment level is unclear and release targets are diverse. In this paper, the anatomical basis and pathogenesis of cervical headache are discussed. By comparing the clinical efficacy of ultrasound-guided needle knife therapy and ultrasound-guided nerve block therapy for patients with chronic cervical pain, the effectiveness and safety of ultrasound-guided needle knife therapy for chronic cervical pain are further studied. It is beneficial to clear the target level of needle knife release and standardize the operation treatment, providing reference basis for clinical treatment.

2. Information and Methods

2.1 General Information

A total of 120 patients with chronic neck pain, including 98 patients aged 60 and above, were selected from the pain clinic of a hospital. The clinical trial was approved by the hospital ethics committee, and patients signed informed consent forms before the trial.

2.1.1 Inclusion Criteria

1) Neck Pain over 3 Months, Aged 60 Years and Above; 2) Visual Analog Scale,Vas) is Greater Than 3; 3) Physical Examination or Ultrasound Images Can Find Trigger Points in Neck.

2.1.2 Exclusion Criteria

1) Pregnant women; 2) Having received cervical needle knife, dry needle or cervical vertebra operation; 3) cervical spondylotic myelopathy; 4) Tumors, coagulation disorders, neuromuscular diseases, cervical spine sequence disorders; 5) Uncontrolled hypertension, coronary heart disease, cerebrovascular disease, alcoholism and drug allergy; 6) history of cervical vertebra injury, cervical vertebra fracture or trauma; 7) Primary cervical arthropathy.

  DOI: 10.25236/acete.2019.085

2.2 Treatment Methods and Grouping

Needle knife intervention group: ultrasound-guided needle knife treatment, treatment targets include corresponding segments of paravertebral and posterior tubercle needle knife lysis, treatment once a week, three times in a row. Nerve block group: ultrasound-guided nerve block therapy, with therapeutic targets including injection of corresponding segmental paravertebral and posterior tubercle nerve block drugs. The nerve block solution was prepared in a unified proportion, i.e. dexamethasone 5mg+ lidocaine 100mg+0.9% sodium chloride 15mL, and nerve block solution 3mL was injected at each block point, once a week for 3 consecutive times.Then, the puncture point was used as the needle insertion point of the needle knife, and ultrasound of musculoskeletal revealed the needle insertion path. Cross cutting and decompression were performed. If articular process hyperplasia affects puncture, the above procedure can be repeated, and the needle tip position can be adjusted to the periphery of articular process for injection. Drug control group: oral NSAID S once a day for 3 weeks.

2.3 Observation of Curative Effect

The cervical disability index NDI: 6 questions for each item. The score ranges from 0 to 5 and the total score ranges from 0 to 50. Northwick Park Neck Pain Scale NPQ (Northwick Park Neck Pain Questionnaire): A total of 9 questions with a score of 0 to 4 for each question, and NPQ percentage is a total score of 9 questions /36×100%. VAS: The number “0” means painless, and the number “10” means severe pain and unbearable. The patient pointed out the corresponding number according to the degree of pain. This study mainly observed the changes of indexes in the three groups of patients one week before treatment, six months after treatment and one year after treatment.

2.4 Statistical Analysis

SPSS17.0 statistical analysis software was used. The measurement data is expressed in $\bar{x}$ ± s. The VAS score and quinnell score between the two groups were compared by t-test of two independent samples. Before and after treatment, the VAS score and quinnell score were compared by paired t-test. The difference was statistically significant ($P < 0.05$).

3. Result

Before and after treatment, the indexes of acupuncture knife intervention group, nerve block group and drug control group were improved, the difference was statistically significant (< 0.05). (Table 1).

Table 1 Comparative Analysis Of Needle Knife Intervention Group, Nerve Block Group and Drug Control Group Before and after Treatment

Indicators	Grouping	The first month	After 5 months of treatment	After 12 months of treatment
VAS	Needle knife intervention group	6.04±1.32	3.31±1.54	3.14±1.51
	Nerve block group	6.12±1.20	3.12±1.25	3.42±1.13
	Drug control group	6.19±1.82	3.40±1.48	4.72±1.02
NPQ	Needle knife intervention group	0.41±0.02	0.24±0.11	0.16±0.13
	Nerve block group	0.43±0.01	0.27±0.06	0.15±0.07
	Drug control group	0.46±0.11	0.23±0.18	0.24±0.16
NDI	Needle knife intervention group	18.40±2.84	7.81±3.19	12.42±5.10
	Nerve block group	17.99±2.85	7.54±4.51	13.88±4.28
	Drug control group	18.64±2.10	7.75±4.32	13.37±2.71

36 patients in needle knife intervention group have successfully completed ultrasound-guided drug injection combined with needle knife therapy, with a technical success rate of 100%. One patient had a layer of septum in tendon sheath due to anatomical variation, and drugs were injected into the two compartments respectively. Because of the large amount of hydrops in tendon sheath, 3 patients were injected with drugs after aspiration of hydrops. In the drug control group, 40 patients

were treated with the drug injection and needle knife according to the location of palpation. In NDI score, the needle knife intervention group was better than the nerve block group and the drug control group, the difference was statistically significant (< 0.05). One year after treatment, there were statistically significant differences in VAS, NPQ and NDI scores among the three groups (< 0.05) (Table 2).

Table 2 the Difference Analysis of Each Index One Year after Treatment in the Second Half Grade between Groups

	Variable	Drug control group	Nerve block group	Needle knife treatment group	P
		(n=40)	(n=40)	(n=40)	0.284
Six months after treatment	VAS	3.26±1.36	3.11±1.8	3.34±1.58	0.631
	NPQ	0.25±0.14	0.22±0.18	0.26±0.15	<0.001
	NDI	12.84±4.43	12.64±4.71	7.84±3.38	<0.001
One year after treatment	VAS	4.71±1.04	3.40±1.36	3.19±1.25	<0.001
	NPQ	0.26±0.14	0.18±0.07	0.14±0.16	0.026
	NDI	13.28±2.71	13.09±4.41	12.42±5.50	<0.001

In the acupuncture knife intervention group, 35 cases were effective and effective half a year later, the total effective rate was 87.5%, 31 cases were effective and effective one year later, the total effective rate was 77.50%. The VAS score and quinnell score of nerve block group and drug control group were significantly lower than those before operation (P < 0.05). In the ultrasound group, the VAS score and the Guinell score were lower than those of the control group at one week after surgery (P <0.05). The total effective rate of the needle-knife treatment group six months and one year after treatment were higher than those of the nerve block group and the drug control group.

4. Discussion

The results of this study show that compared with ultrasound-guided nerve block in the treatment of chronic cervical pain, ultrasound-guided needle knife has more obvious improvement in VAS score, DNI index, SF-36(PCS), SF-36(MCS) (there are statistical differences in 3 months after treatment and 6 months after treatment, p < 0.05). There are reports that 5% ~ 15% of low back pain is affected by facet joints [3], and the prevalence rate of arthritis will also increase with age. In the elderly population without trauma history, the incidence rate of lumbar facet joint-induced low back pain is about 27% ~ 53% [4]. Starting from the change of compensatory mechanical structure of cervical vertebral body and soft tissue, mechanical structural disorders lead to the occurrence of “inflammation” and “entrapment”, which stimulate the high cervical nerve and its branches, thus causing headache [5]. The pathogenesis of cervical spondylosis is “dynamic imbalance comes first, static imbalance mainly”. The imbalance of cervical muscle strength plays an important role in the occurrence and development of cervical spondylosis. Lumbar facet joint is the most important stable structure of lumbar posterior column and belongs to synovial joint. Articular pain is now considered as a disease including articular cartilage, subchondral bone, ligament and capsule. Osteoarthritis or joint cyst formation caused by joint hyperplasia is common. NPQ scale results show that one year after ultrasound-guided needle knife treatment, the impact of chronic neck pain on daily life of patients is significantly reduced, and the effect is better than that of nerve block group and drug treatment group.

NDI score indicates that the improvement of cervical spine function in acupotomy group is more obvious than that in nerve block group and drug treatment group after 6 months and 1 year follow-up. Needle knife therapy is a new type of therapy founded in the 1970s. It is a combination of acupuncture and modern minimally invasive surgery. In practice, it integrates the two advantages of acupuncture needle and surgical knife, forming a set of unique diagnosis and treatment technology, which has good curative effect on chronic soft tissue injury, hyperosteogeny, chronic joint diseases, spinal diseases and other diseases, and is also an effective means to treat chronic neck pain [6]. In principle, the shortest puncture path should be taken to avoid blood vessels and nerves. Because the

tendon and tendon sheath of abductor pollicis longus and extensor pollicis brevis are superficial, the needle is inserted at the contact position between the middle of linear array probe and the body surface. Abnormal cervical soft tissue will lead to instability of cervical segments and changes in cervical physiological curvature. The emphasis on the role of muscular dynamic system in the development of cervical spondylosis is not to ignore the influence of the internal stable structure of cervical vertebra on cervical spondylosis. The trilateral and quadrilateral holes formed near the lateral edge of the shoulder and foot bones by the external teres major, teres minor and the long head muscle of Oboro triceps are inconsistent in the course of muscle fibers. Under normal physiological conditions, each muscle bundle has corresponding fascia and other protective muscles with little wear. Before entering the bone fiber tube, 1-2 joint branches are distributed on the upper part of the joint. After exiting the bone fiber tube, another recurrent branch is issued to dominate the lower part of the joint. At the same time, it also sends out a descending branch, which is distributed on the upper medial part of the inferior articular process. There are many methods to treat chronic neck pain clinically. Among them, the probability of acute and serious complications in surgery is 4%, the safety is questioned and the hospitalization time is prolonged [7]. Some studies believe that acupuncture and moxibustion treatment of chronic neck pain has relatively low cost [8].

In recent years, ultrasound is increasingly used in guided puncture and minimally invasive interventional therapy. The safety and accuracy of ultrasound-guided needle knife therapy have been recognized. Since out-of-plane puncture can only show the cross-section of the puncture needle and cannot dynamically show the needle insertion path, the needle insertion depth should be measured before puncture, and the needle tip position should be observed during puncture. Shi Chunlei et al. believe that ultrasound is of great value in evaluating the diagnosis of Z joint, and can clearly show lesions such as facet joint hyperplasia and joint destruction [9]. Fu Shuiqing et al. applied ultrasound-guided facet joint injection into lumbar facet joint syndrome has clinical feasibility and good safety [10]. The needle knife is inserted into the acromion direction at the anterior corner of the acromion, i.e. the intersection point of the anterior middle 113 of the deltoid muscle, which is a natural dividing line of the deltoid muscle and has less bleeding. The needle body and muscle fibers move in the same direction. First, longitudinal dredging and stripping are performed to release adhesion. Permeability stripping is required for acromion glide capsule. The medial branch is distributed in the multifidus muscle, while the lateral branch is distributed in the longissimus capitis muscle, the cephalic clamp muscle and the cephalic hemispinus muscle. The branches of these nerves are located at the angle near the vertebral artery before entering the cranial cavity through the foramen magnum of occipital bone, and are easy to be injured by the stimulation of vertebral processes and muscle attachments. Therefore, the combination of puncture technology and musculoskeletal ultrasound technology has a very good application value in accurately guiding puncture into the articular capsule of the articular process and around the articular process through musculoskeletal ultrasound guidance.

Previous studies have reported that inflammatory effusion is one of the main causes of pain due to its great irritation to the peripheral tendon sheath [11]. Therefore, it is more beneficial to relieve the pain symptoms to extract the effusion in tendon sheath first. Different from X-ray fluoroscopy and CT, ultrasound does not have ionizing radiation for both the operator and the patient, so it is also applicable to pregnant patients. Ultrasound has the characteristic of real-time observation, and can monitor puncture approach and diffusion range of liquid medicine. Injecting drugs into the joint capsule can inhibit arthritis and traumatic inflammation caused by needle knife operation. If the periarticular hyperplasia is obvious and cannot be punctured into the articular capsule, the analgesic effect can be achieved by accurately positioning the periarticular process, performing upstream neurodrug block and needle knife damage. Yao Yaqiang's biomechanical test of cervical facet joint capsule found that stretching the joint capsule beyond the physiological range would lead to morphological changes of axons of C-type nerve fibers in the capsule wall, which may lead to neurogenic pain [12]. The spinal canal is the spinal cord. The anterior root from the anterolateral sulcus of the spinal cord and the posterior root from the posterolateral sulcus synthesize spinal nerves at the intervertebral foramen. The vertebral artery passes through the transverse foramen

other than the seventh cervical vertebra from the transverse foramen of atlas and enters the cranial cavity through the vertebral artery groove from the foramen magnum. Thickened ligamentum flavum in the intervertebral disc can protrude into the spinal canal, compressing dural sac to produce spinal canal stenosis, while thickened ligamentum flavum in the articular capsule can directly compress nerve root to produce similar signs of lumbar disc herniation. It is usually easy to occur between the lumbar lamina of L4-5. According to relevant statistics, the incidence rate of ligamentum flavum hypertrophy can account for 14% of sciatic nerve surgical exploration cases [13].

5. Conclusion

Puncture and needle knife and other local administration methods of articular process joints are reliable methods for the treatment of lumbar facet joint lumbago, while needle knife guided by musculoskeletal ultrasound has incomparable advantages in the treatment of lumbar facet joint-derived lumbago. From the results of this study, compared with nerve block therapy and drug therapy, ultrasound-guided needle knife therapy has a more significant long-term effect. Ultrasound-guided drug injection combined with needle knife is feasible in the treatment of stenosing tenosynovitis of radial styloid process and is worthy of clinical application. However, at present there is no ultrasonic guiding device frame matched with needle knife, and common ultrasonic probe may interfere with needle knife operation. The combination of ultrasound guidance and needle knife therapy can increase scientific basis for needle knife therapy, effectively improve the accuracy of treatment and improve clinical treatment efficiency, which may be one of the development and research directions of needle knife discipline in the future.

References

[1] Li Qinghua, Deng Fang, Lei Zhikai, et al. (2015). Treatment of nerve root type cervical spondylosis with small needle scalpel under the guidance of ultrasound. Zhejiang Journal of integrated traditional Chinese and Western medicine, no. 6, pp. 588-589

[2] Deng Fang, Li Qinghua, Luo Ying, et al. (2016). Observation on the therapeutic effect of acupotomolysis under the guidance of ultrasound on cervical spondylotic radiculopathy. Zhejiang trauma surgery, vol. 21, no. 2, pp. 206-208

[3] Zhong Zhinian, Gui Hua, Jin Kang, et al. (2019). Observation on the therapeutic effect of acupotomotor stimulation of stellate ganglion on cervical spondylosis of vertebral artery type under the guidance of ultrasound. Guide of traditional Chinese medicine, no. 10, pp. 82-84

[4] Chen Rui, Dong Bo, Yao Jie, et al. (2019). Treatment of 50 cases of chronic piriformis injury with Acupotomy and Panlongqi tablets under the guidance of muscle and bone ultrasound. Chinese Journal of orthopedics, no. 6, pp. 43-45

[5] Liu Hong, Xiu Zhongbiao, Zhang Liangzhi, et al. (2018). Clinical observation on the treatment of cervical spondylosis with acupotomolysis under the guidance of ultrasound. Fujian traditional Chinese medicine, no. 3, pp. 8-10

[6] Shen Wei, Zheng Yongjun, Xie Nanhai, et al. (2019). The effect of ultrasound-guided acupotomolysis combined with pulse radiofrequency in the treatment of knee osteoarthritis. Journal of practical pain, vol. 15, no. 1, pp. 47

[7] Liang Dong, Dai Lingyun, Shen Wen. (2018). Clinical observation of small needle knife combined with silver needle in the treatment of cervical headache. International Journal of Anesthesiology and resuscitation, vol. 39, no. 11, pp. 1031-1033

[8] Fan Houbao, Guo song, Ding Fang, et al. (2018). Effect of ultrasound-guided acupotomolysis combined with compound betamethasone injection on carpal tunnel syndrome. Journal of practical pain, vol. 14, no. 2, pp. 133-136

[9] Shi Chunlei, Li Changxiong. (2016). Clinical observation on the treatment of carpal tunnel syndrome with high frequency ultrasound guided small needle scalpel. Medical frontier, vol. 6, no. 33, pp. 140-141

[10] Fu Shuiqing, Duan Haiping, Zheng Xinhua, et al. (2016). Clinical study on the treatment of piriformis syndrome by ultrasound-guided needle knife combination block. Medical frontier, vol. 6, no. 15, pp. 91-92

[11] Wang Lei, Han Zhongwei, Zhu Xianyou, et al. (2015). Clinical comparative study on the treatment of chronic cervicogenic headache with conventional physical therapy and small needle knife combined therapy. Chinese modern medicine application, no. 19, pp. 83-84

[12] Yao Yaqiang. (2015). Analysis of clinical effect of small needle knife combined therapy on chronic cervical headache. Medical theory and practice, vol. 28, no. 9, pp. 1182-1183

[13] Ye Yongjun, Liang Zhiwei, she Shouzhang, et al. (2018). Comparison of the therapeutic effect of suprascapular nerve surgical release under ultrasound and needle knife release under blind exploration on suprascapular nerve compression syndrome. Journal of practical pain, vol. 14, no. 2, pp. 118-123.