

Study on Neurac Rehabilitation Training Methods for Non-motor Chronic Pain in Shoulder and Neck

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Abstract: Shoulder and neck pain caused by sedentary work has become a significant problem for office workers. This type of shoulder and neck pain belongs to non-motor chronic pain, and the main clinical symptoms are limitation of activity and pain on one or both sides. Comprehensive methods, including surgery, traditional Chinese medicine, and rehabilitation training, are used in the treatment. In recent years, Neurac has been widely used to treat non-motor chronic pain due to its properties of stimulating deep muscle strength and regulating muscle balance and stability. This paper uses chronic pain in the shoulder and neck as an example to study its training methods and steps.

Keywords: Shoulder and neck pain; Non-motor chronic pain; Neurac; Rehabilitation training

1. Introduction

According to the International Association for the Study of Pain, 1 / 5 of the world's people have experienced chronic pain. According to the report on the development of pain medicine in China, more than 300 million people in China are suffering from chronic pain. The proportion of patients with non-motor chronic pain in the shoulder and neck is higher. In addition, among the patients who sought medical help, up to 43 % to 79 % of the patients said that their control effect was poor, and they were not satisfied with the treatment and nursing results [1]. Neurac is a new and effective neuromuscular function training technique focusing on the coordinated development of agonist and antagonistic muscles [2]. It is often used in adjustable unstable slings to implement closed-chain movements. Imbalances in the strength of agonist and antagonistic muscles often cause non-motor chronic pain in the shoulder and neck. Studies have shown that exercise on unstable surfaces can enhance muscle stability and overall development. Therefore, treating the shoulder, neck, and lower back with the Neurac technique is more favorable for pain relief and functional recovery than conventional physiotherapy [3].

2. Non-motor Chronic Pain in the Shoulder and Neck

2.1 The Concept of Non-motion Chronic Pain

Chronic pain generally refers to pain that lasts for more than three months. It can be divided into two categories: chronic pain from sports and non-motion chronic pain. The former refers to pain caused by movement or activity and is highly correlated with the intensity and frequency of exercise, unlike general short-term athletic pain or muscle soreness. Non-motor chronic pain is usually caused by sedentary and maintaining a curved neck and arm extension, which exceeds average tissue healing time [4]. It is generally associated with abnormalities in the nervous system and transmission abnormalities.

Non-motor chronic pain is usually accompanied by fatigue and sleep disorders. Currently, drugs and physical and psychological therapies are primarily used in hospitals [5]. With the increase in prevalence and improvement of people's cognition, patients gradually turn to individualized treatment based on physical methods.

2.2 The Etiology of Non-motor Chronic Shoulder and Neck Pain

The neck is the thinnest part of the human body, and the shoulder joint is the most flexible. The stability of the two is poor, and the neck and shoulder are vulnerable to damage. Office workers sit on desks or sofas for a long time and are in a state of neck flexion and arm extension for a long time. Usually, there is only repeated movement of the upper limbs, basically no muscle activity of the lower limbs. In

the state of neck flexion, a long-term static posture will cause excessive fatigue of shoulder and neck muscles, destroy the stability of soft tissue [6], and produce chronic pain in the shoulder and neck.

2.3 Treatment Dilemma of Non-motor Chronic Shoulder and Neck Pain

Non-motor chronic pain in the shoulder and neck causes a series of pathophysiological changes from the peripheral to the central nervous system. Until now, the clinical treatment methods in China have included drug therapy, physical therapy, functional exercise, and surgical treatment [7]. Among them, physiotherapy is in the research and development stage, and there is a big gap in treatment techniques between China and developed countries. Surgical treatment is invasive and costly. For example, for the treatment of cervical scoliosis, the cost of surgery ranges from RMB 80,000 to 150,000, and post-operative rehabilitation is also expensive.

3. Neurac Technique

3.1 The Concept of Neurac Technique

Neurac is a new and effective neuromuscular function training technique that has been applied to treating chronic pain in many studies and has achieved positive results. It activates the stability of the core area, strengthens the weak chain through sling exercise therapy (SET), and strengthens the feedback between the nerve and the muscle group by moving on an unstable plane. Neurac adheres to the principles of individualization and progression. On the SET device, the body activates the deep stabilizing muscles more in an unstable state. Some body weight is excluded and makes lasting muscle improvement by promoting deep trunk muscle contraction when pain-free [8]. The surface muscles are responsible for exercise, while the deep muscles are responsible for stability. Numerous studies have shown that pain or prolonged disuse of the deeper muscles can cause them to tend to "shut down", which in turn leads to a decrease in one's ability to move and in neuromuscular control. If there is no treatment, even if the pain is relieved, the stability of the deep muscles still has a tendency to "shut down", which will primarily cause damage and hurt again and eventually form chronic injury. Therefore, the core of the Neurac technique is to activate the deep muscles to allow them to perform normal function, mainly relying on sensory-motor therapy, which uses sling devices, balancing cushions, and vibrating instruments to achieve strengthening of the spine and joints through a combination of closed-chain and open-chain movements [9].

3.2 Advantages of Neurac Technique in the Treatment of Non-motor Chronic Pain

Neurac training is increasingly popular to relieve pain, enhance muscle activity, and improve health-related quality of life [10]. In training and treatment, it is aimed at continuous improvement of the musculoskeletal system and offers significant advantages in the treatment of chronic pain in the shoulder and neck area: One is that it relieves spasticity and reduces muscle tone caused by muscle and joint disorders, and the other is that it improves muscle metabolism and thus promotes muscle mobility [11]. In addition, the entire training process is always painless.

Neurac training is safe and relaxing throughout. The patient is suspended from a rope, and the instructor uses training in unstable conditions to increase active stabilization requirements. They use strings to regulate gravity to control the intensity of the exercise and avoid the inhibition of pain on function. In addition, the instructor follows the patient to appropriately reduce the elastic rope support and weight to carry out progressive resistance training [12], which improves the patient's proprioception and neuromuscular control needs and is more likely to make the patient feel and control the movement of all segments of the body [13].

The comparison between the two techniques for treating chronic pain in the shoulder and neck is shown in Table 1.

Table 1: Comparison between Neurac technique and surgical treatment

Index\ Therapies	Age of patients	Treatment cycle	Cost	Risk	Proprioception	Trauma	Sequela
Neurac technique	For all ages	Long	Low cost	Low	Comfort	Less trauma	None
Surgical treatment	Most are teenagers	Short	High cost	High	More painful	More trauma	Yes

4. Neurac Technique for Shoulder and Neck Rehabilitation Training

When using the Neurac technique, you need the assistance of an instructor. There are slight differences in the training movements for male and female patients. For patients with different strengths and foundations, the intensity of training can be adjusted by moving the height and distance of the rope hanging the patient, and the difficulty of exercise can be adjusted by applying high-frequency vibration to the string.

The training is divided into two parts. The first part is the weak link testing. The patient must carry out the weak link testing so that the instructor fully understands the patient's body muscle function. The second part is the sling exercises combined with vibration.

4.1 Weak Link Testing

Weak Link Testing (WLT) is the evaluation of muscle dysfunction by the suspension system. If the patient cannot complete the movements correctly during the weak link testing process or experiences pain or bilateral movement asymmetry, these are all considered weak link positives. A positive weak link indicates the patient has one or more weak links in the myofascial chain. The test evaluates the muscle strength of the inactivated muscle and determines the degree of muscle weakness and functional limitation [14].

4.2 Sling Exercises with Vibration

The sling exercises with vibrations are performed according to the patient's specific pain site and cause. Chronic pain caused by the shoulders and neck immobility usually indicates a problem with muscle function in the posterior regions. The sling exercises with vibrations for shoulders and neck can be performed separately, or you can train the entire side chain together.

4.2.1 Training Movements for the Neck

(1) The patient lies supine on the rehabilitation bed, with the heel of the foot in the grip band, the lower back in the wide band, the head suspended in the cervical band, and the hand placed on the opposite shoulder. The shoulder blades are pointing downwards. When the rehabilitation bed is lowered, the patient retracts his chin, lifts his neck, and performs neck extension training. He remains static for 10 seconds, with a 10-second interval between each set. Do three sets of moves.

(2) The patient lies supine on the rehabilitation bed, with the heel of the foot in the grip band, the lower back in the wide band, the head suspended in the elastic band of the cervical spine, and the hands placed on the opposite shoulders. The shoulder blades are pointing downwards. The patient retracts his chin and lifts his neck as the rehabilitation bed is lowered. Then, slowly turn his head to the right, rotate to maximum range, and hold still; hold for 10 seconds, and do one rep on the left and one on the right side, with 10-second intervals in between. Do three sets of moves.

(3) The patient lies on the rehabilitation bed in the lateral position with the legs slightly flexed. The hand on the side close to the bed is placed on the contralateral shoulder, and the other is naturally relaxed and placed on the hip. The head is suspended on the elastic band. The instructor holds one hand to the patient's cervical spine, and the other guides the patient's head to the maximum back. The patient maintained the posture of retracting the jaw top neck. The human spine has a total of 7 segments. Except for the first segment, which has no spinous process, the remaining 2-7 pieces have spinous processes that can be touched. So do this action six times on one side and switch to the other side after six times.

4.2.2 Training Movements for Shoulders

Training movements for shoulders vary significantly according to the strength of patients. The first three movements are suitable for female patients, or those with less power, and the 4-8 movements are suitable for male patients or those with greater strength.

(1) The patient was prone, kneeling on the rehabilitation bed, feet flat, arms suspended on the narrow band, and the narrow band was below the elbow. Begin training: the body leans forward, the abdomen is tightened without collapsing the waist, and the arms reach forward and then recover. Then the arms are pressed down when recovering. The body has been kept immobile, only moving arms, a set of 10 times.

(2) The patient lies prone, kneeling on the rehabilitation bed, with his feet flat and his forearm hanging on a narrow band, which is slightly below the elbow. Begin training: lean forward, the abdomen is

tightened without collapsing the waist, the body leaning forward to do flexion of the arm outward movement; and the arms are pressed down when recovering to support the body, with the whole body to control the suspension of the red rope, a set of 10 times.

(3) The patient was prone, kneeling on the rehabilitation bed, feet flat, arms suspended on the narrow band, and the narrow band was below the elbow. Begin training: the body leans forward, and the abdomen is tightened without collapsing the waist. The arm is extended forward for 1 second, and then the arm is inclined 45° to return to the flexion arm abduction for 1 second. After the arm is recovered, the arm is pressed downward, and then the prone position is restored to prepare the action. After that, the arms are bent and abducted for 1 second, tilted at 45° , and extended forward for 1 second. Finally, he returned to the prone position. Two laps are counted once, and a group of five times.

(4) The patient lies prone, kneeling on the rehabilitation bed, with his forearm hanging on a grip band slightly below the elbow. Begin training: Do planks on the rehabilitation bed. Do not keep hands too far apart; the abdomen is tightened without collapsing the waist. Do three sets of moves.

(5) The patient took a prone position kneeling on the rehabilitation bed, holding the handle in his hand, doing push-ups, the back side chain clip buttocks, back straight, a group of about ten times. Do three sets of moves.

(6) The patient knelt on the rehabilitation bed in a prone position, holding the handle in his hand. Begin training: Support his arms and keep the back chain between his hips and back straight to keep his body stable and still. Next, press down on the red rope with one arm, slowly release the pressure, and work with the other to push down as hard as possible. The arm on one side of the red rope is pressed first to release the pressure slowly, and the gravity is transferred to the opposite arm. One group is about ten times, a total of three groups.

(7) The patient lies supine on the rehabilitation bed. The feet were suspended on the grip band, the buttocks on the wide band, and the big arm on the narrow band. The head is suspended on the elastic band of the cervical spine, holding the handle elastic band. The small and big arms are at an angle of 90° , and the big arm and the body are at an angle of 90° . When the rehabilitation bed was lowered, the patient retracted his chin and lifted his neck, the scapula retracted, the big arm remained motionless, and the palm was downward. The forearm is downward ten times, the palm is up, and the lower arm is down ten times. Do three sets of moves.

(8) The patient lies supine on the rehabilitation bed, with his feet hanging on the grip band apart, his buttocks depending on the wide band, his head hanging on the elastic band of the cervical spine, and his hands holding the handle of the elastic band. In the process of rehabilitation bed decline, the patient retracts his chin and lifts his neck, the scapula retracted, the arm extended, and the palm upward to do the circle movement. The patient's arms force and elastic band against resistance. At the same time, row from near the hips to the top of the head via the outside, then row from the top of the head back near the hips for 15 reps. Do three sets of moves.

5. Conclusion and Suggestion

5.1 Conclusion

Unlike traditional treatment, Neurac technology can activate deep muscles and increase musculoskeletal advantages, providing a new perspective for treating related diseases. The research found that using Neurac can effectively relieve pain and improve function. In addition, the survey results show that Neurac therapy suits most people. Young patients have a high degree of acceptance and cooperation with the instructor, and the number of training sessions per week can reach four times.

However, the development of Neurac still faces many challenges: (1) The public's awareness and social support for Neurac is not high; (2) The regularity of training must be guaranteed; otherwise it will significantly affect the training effect; (3) It is greatly affected by individual differences such as patient age and education level, so the product cannot be guaranteed to be the same; (4) Relevant personnel need to constantly update the theory and verify and improve it in combination with practice and experience; (5) There is a shortage of talents for national rehabilitation development. With the progress of clinical research and medical treatment technology, Neurac therapy will play a more significant role in the future.

5.2 Suggestion

First, when walking, don't humpback or head forward; when sitting, avoid humping and bowing for a long time. In addition, a long-term single-shoulder backpack will lead to tension of shoulder and back muscles on one side, causing muscle strain. Reduce the pressure on the cervical spine and shoulder and strengthen the stability of the shoulder and neck through proper exercises, such as cervical vertebra exercises, shoulder massage exercises, swimming, flying kites, and other non-violent activities.

Second, cultivate good habits, pay attention to the warmth of the cervical spine and shoulders, and avoid actions that easily damage the neck and shoulder joints.

Third, when it comes to sleeping, choose a pillow that is a fist in height and place it under your neck. For sleeping position, it is recommended that patients with chronic shoulder and neck pain choose to sleep on their backs and sides, which helps the body's muscles, ligaments, and joints to relax.

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