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Fu's Subcutaneous Needling: A Novel Therapeutic Proposal

Zhonghua Fu and Dejian Lu

Abstract

Fu's subcutaneous needling (FSN) uses disposable FSN acupuncture needle as its tool to stimulate the subcutaneous layer by doing horizontal sweeping manipulation. Needling sites are mainly selected around or near tightened muscles which contain one or several myofascial trigger points and cause pain or other illnesses. FSN therapy is originated from classics and based on clinical practice. Out of inheritance and innovation, it is the scientific research achievement of Fu Zhonghua and his research team over 22 years of hard work. It is the original and innovative technology with independent intellectual property rights. FSN therapy is safe, nontoxic, and has no side effect. This chapter is drafted in order to facilitate clinical study and application, by which the terms and definitions, indications and contraindications, operating procedures, exceptions, and the relative handling as well as precautions are written down.

Keywords: Fu's subcutaneous needling (FSN), FSN therapy, tightened muscle (TM), insertion point, sweeping movement, reperfusion approach

1. Terminology and definition

The following terms and definitions apply to this standard.

1.1 Fu's subcutaneous needling

Fu's subcutaneous needling (FSN) uses disposable FSN acupuncture needle [1] as its tool to stimulate the subcutaneous layer [2] by doing horizontal sweeping manipulation. Needling sites are mainly selected around or near tightened muscles (TM) that cause pain or other illnesses [3–5].

1.2 Tightened muscle (TM)

TMs are the muscles that are still in pathologically tense state when patients are relaxed under the condition that the central nervous system functions normally.

1.3 Pre-muscular diseases

Pre-muscular diseases refer to the diseases that cause chronic ischemia and oxygen deficit, leading to pathological tension of muscle and its subsidiary structure.

1.4 Real-muscular diseases

Real-muscular diseases are caused by pathological tension of the muscle and its subsidiary structure due to chronic ischemia and oxygen deficit.

1.5 Post-muscular diseases

Post-muscular diseases refer to a series of diseases caused by the muscles with pathological tensions that affects other organs (e.g., nerve or blood vessels) which are mostly distributed in or nearby the muscles.

1.6 Needle manipulation

Needle manipulation refers to pushing the needle to a proper depth after the needle is inserted into the subcutaneous layer.

1.7 Sweeping movement

Sweeping movement refers to a series of parallel and left-to-right movements of the needle in the subcutaneous layer after the needle manipulation.

1.8 Reperfusion approach

Reperfusion approach is to make tightened muscles contract vigorously within a short time and then relax in order to supply more blood to the ischemic part. It is suggested to provide equal force back by doctors when the muscles contract.

Reperfusion approach is often used during sweeping movement, and it can also be used separately for treatment of mild illnesses.

2. Basic characteristics of tightened muscle and its clinical evaluation

When patients relax their inspected area and their central nervous systems function normally, practitioners can still feel the “tightness, stiffness, hardness, and slipperiness” feelings when touching the targeting muscles with finger pulps. Patients often have spontaneous discomfort, pains, or obvious abnormal sensations. The joints that are associated with TMs are often weak and lack of strength. The range of joint activities is often reduced.

2.1 The clinical evaluation of tightened muscles

The muscle tension states are divided into five grades in clinical practice, which are defined as follows:

- : Muscles are soft and their activities are normal.
- +: There is mild muscle tension without obvious clinical symptoms.
- ++: Muscles are moderately strained and stiff and are often accompanied by clinical symptoms which can often be reduced after a break.
- +++: Muscles are tense and stiff with associated pains and other symptoms.
- ++++: Muscles are severely tense and stiff, and if touched with finger pulps, some changes like clumps and abnormal muscular band on the muscle belly can be felt. Severe intolerable painful symptoms are often accompanied. There is no relief after a break, and it even affects normal life.

2.2 Clinical manifestations of tightened muscles

Clinical manifestations of TMs can be divided into five major categories, including symptoms caused by TM directly or indirectly, by muscular internal organs, by dysfunctions of sleep, by emotions, and by those with unknown reasons.

2.2.1 *The first major category*

Clinical chief complaints that are directly caused by TMs: pain, dysfunction, and lack of power.

The main diseases include cervical spondylosis, tennis elbow, lumbar disc herniation, chronic knee pain, ankle sprain, etc.

The characteristics of muscle-induced pains:

- a. Pains that are usually characterized by sourness, swelling, or tingling in rare cases.
- b. Pain positioning is often inaccurate, and patients usually can only point out vague directions.
- c. Peripheral muscle tissues or synergistic muscles are often affected.
- d. Most of the pains can be relieved by hot compress and massage but not by pressure. Simple touching or rubbing the skin has no effect on the pain.
- e. The degree of pain may aggravate when influenced by cool weather, muscle fatigue, lack of sleep, and bad mood.
- f. Pain tends to decrease after using nonsteroidal analgesics, after the related muscles are relaxed, after the weather gets warmer, and after receiving massage and encountering emotional pleasure.
- g. Long-term pain often causes changes in related bones and joints, such as hyperosteo-geny, pseudospondylolisthesis, scoliosis, knee deformity, etc.

2.2.2 *The second major category*

TMs affect the internal or nearby nerves, arteries, and veins:

- a. The main manifestations related to the affected nerves are the downstream symptoms of TMs, such as numbness.
- b. The main manifestations related to the affected arteries are symptoms caused by TMs, such as headache, dizziness, chills, aversion to cold, contact temperature dropping, and even cold feeling of the whole body.
- c. The main manifestations related to the affected veins are the downstream symptoms caused by TMs, such as edema, heaviness, itching, and skin darkening.

2.2.3 *The third category*

Pathological tension of neighboring skeletal muscles and muscular visceral lesions affects the body at the same time, and there is a close relationship between

them; both of them often appear at the same time and disappear simultaneously after treatment. The clinical TM manifestations which belong to different systems of the human body are as follows:

- a. Symptoms related to smooth muscles of the respiratory system include dry cough, chronic cough, asthma, chest short breath, breathing disorders, etc.
- b. Symptoms related to heart muscle include chest tightness, palpitations, shortness of breath, chest pain, etc.
- c. Symptoms related to gastrointestinal smooth muscles include stomach bloating, heartburn, acid regurgitation, belching, loss of appetite, emaciation, habitual constipation, chronic diarrhea, afraid of cold food cold drinks, etc.
- d. Symptoms related to smooth muscles of the urinary system include urinary frequency, urgency, ureteral calculus, urine leakage, etc.
- e. Symptoms related to smooth muscles of the reproductive and urinary system include:
 - i. Female: dysmenorrhea and menstrual abnormalities.
 - ii. Male: impotence, etc.

2.2.4 The fourth category

Symptoms related to mood and sleep, anxiety, insomnia, and mood swings.

2.2.5 The fifth category

A class of symptoms due to unknown causes, related to autonomic nervous dysfunctions and proprioceptive disorders.

Symptoms related to autonomic nervous dysfunction, such as abnormal sweating, continuous tears, continuous catarrhal rhinitis, excessive salivation, and discomfort of chest areas.

Symptoms related to proprioceptive disorders, such as imbalance, dizziness, tinnitus, weakness, and weight perception disorders.

2.3 How to check TMs

- a. Mark the patient's painful positions.
- b. List all possible muscles based on anatomical and biomechanical knowledge.
- c. Use thumb pulp or pulps of index finger, middle finger, and ring finger to touch the muscular tensions of suspected muscles. If the muscular tension of one muscle is higher than its surrounding area, it can be diagnosed as pathological tight muscle.

3. Indications and contraindications

3.1 Indications

All indications of FSN are related to pathological tight muscles (**Figure 1**).

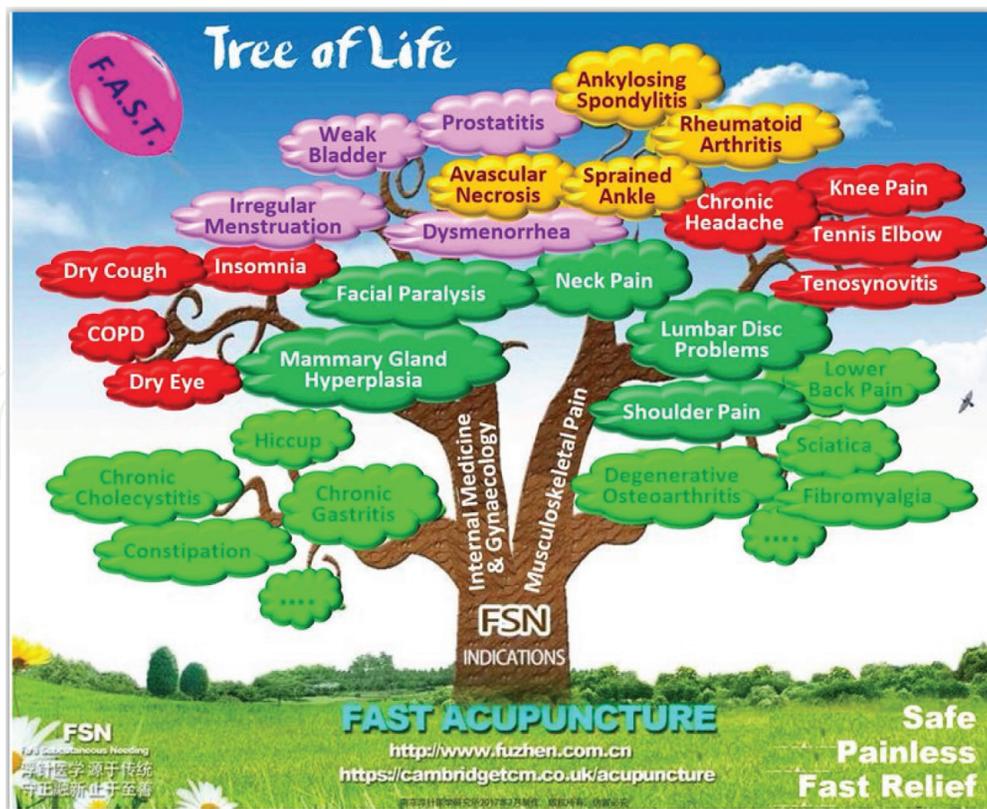


Figure 1.
 The main indications.

3.1.1 Pre-muscular diseases

Ankylosing spondylitis, rheumatoid arthritis, asthma, gout, Parkinson's disease, facial paralysis, frozen shoulder, and so on.

3.1.2 Real-muscular diseases

Cervical spondylosis, tennis elbow, lumbar disc herniation, chronic knee pain, ankle sprain, headache, prostatitis, weak bladder (bladder leakage), hiccups, insomnia, depression, chronic cough, habitual constipation, and so on.

3.1.3 Post-muscular diseases

Dizziness, palpitation, chest tightness, local numbness, local edema, breast hyperplasia, cold disease, macular degeneration, diabetic foot, avascular necrosis of the femoral head, and so on.

3.2 Contraindications

- Patients with infectious diseases, malignant diseases, or patients with acute inflammation and fever.
- People with spontaneous bleeding or coagulopathy, which may result in nonstop bleeding after injury.
- Skin areas with infection, ulcer, scar, or tumor.

4. Operation steps and requirements

4.1 Determine the insertion point

The insertion points are chosen according to the following principles:

- a. In most cases, insertion points are chosen nearby TM. It can be inserted 3–5 cm up, down, left, right, or oblique to the TM.
- b. Insertion points are better to be nearby TMs for small area and less TMs, while insertion points are better to be far away for big area and more TMs.
- c. From far to near, if there are several TMs, such as chronic cervical and lumbar pain, which is usually accompanied by abnormalities of the upper limbs and lower limbs, the insertion points should be chosen from far to near, rather than the opposite.

4.2 Needle selection and body position selection

4.2.1 Needle selection

The FSN inserting device and FSN acupuncture needle should be in accordance with the regulations of national medical device production and sales supervision. In order to prevent needling accidents, the disposable FSN acupuncture needle should be strictly inspected each time before use. If any unqualified conditions such as packaging damage are found, the needle should be eliminated.

4.2.1.1 FSN inserting device

FSN inserting device is a device specifically designed for the inserting of FSN acupuncture needle, which is developed by Nanjing FSN Medical Co., Ltd. It is convenient for the therapist to deliver the needle. It can not only reduce the pain of needle insertion but also ensure the accuracy and safety of the needling. The device consists of four parts, the base, the control button, the needle drive rod, and the groove, as shown in **Figure 2**.

4.2.1.2 FSN acupuncture needle

4.2.1.2.1 The structure of FSN acupuncture needle

The FSN acupuncture needle consists of three components. The combination of the three components is shown in **Figure 3**.

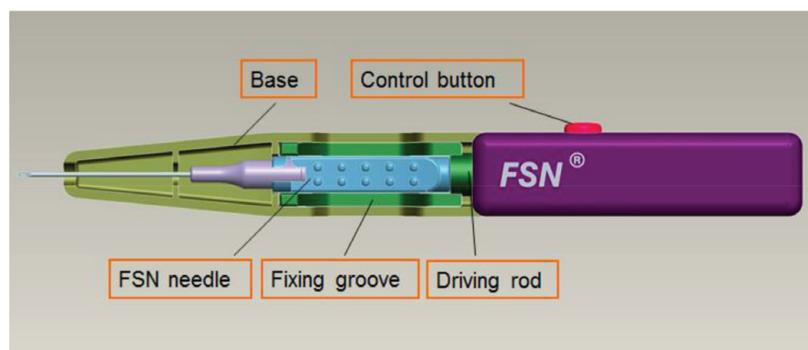


Figure 2.
FSN acupuncture needle in the FSN inserting device.

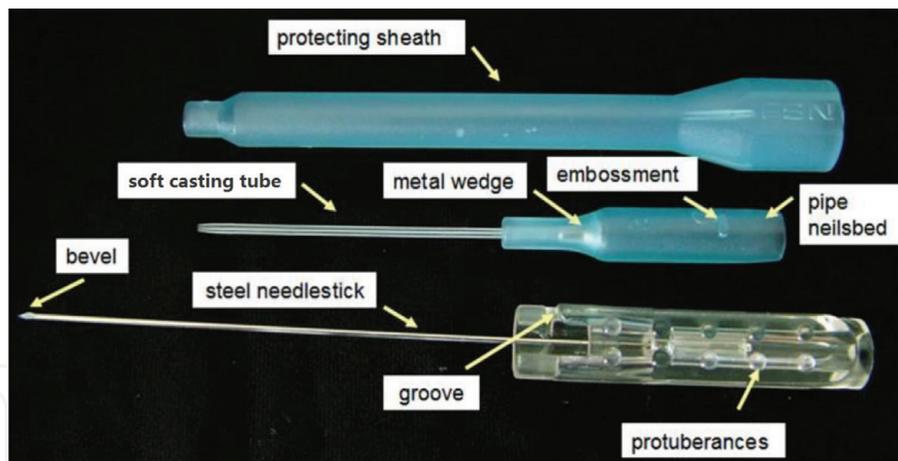


Figure 3.
The three parts of FSN acupuncture needle.

4.2.1.2.2 FSN acupuncture needle core

The needle core consists of a stainless steel needle and a hard-plastic core, as shown in **Figure 2**. This part insures the FSN acupuncture needle to reach enough rigidity to enter the body quickly and to complete sweeping movement. The stainless steel needle tip is beveled. On the base, there are 10 protuberances which are on one side. When the convex protuberances are upward, the beveled tip of the needle is also upward. The surface is in line with the tip of the needle, the front end of the needle has a longitudinal groove, and the front of the groove has a transverse slot on the right side, which is used for fixing the soft casting tube during performing a sweeping movement.

4.2.1.2.3 Soft casting tube and base of FSN acupuncture needle

The soft casting tube covers the stainless steel needle (steel needle inside, soft casting tube outside). The soft casting tube is fixed to the plastic socket through the built-in rivets, as shown in **Figure 2**. The casting tube of FSN acupuncture needle has a bump, which is matched with the grooves in the core seat and the slot. The protuberances on the base are placed at the bottom of the groove when we sweep the needle.

The main function of the soft casting tube:

- a. The tube and the core are anastomosed into one, which is conducive to the stability of the insertion, as well as to the needle manipulation and the sweeping movement.
- b. When performing sweeping movement, the stainless steel needle tip is fully retreated into the soft tube; it can prevent the tingling caused by injuring the blood vessels.
- c. Because of its sufficient softness, the tube which will not affect normal activities of patients can be kept under the skin for several hours after the treatment, and it will not puncture blood vessels and other tissues.

4.2.1.2.4 Protective sheath

To protect the stainless steel needle and soft tube from the impact of the collision, we designed a protective sheath. The protective sheath is used to protect the aseptic state, as shown in **Figure 2**. After the sweeping movement, the solid needle

should not be discarded. It must be put back into the protective sheath to prevent puncturing oneself and others.

4.2.1.2.5 Length, diameter, appearance, and preservation of FSN acupuncture needle

4.2.1.2.6 Appearance of FSN acupuncture needle

FSN acupuncture needle is disposable and can only be used for one time; it is also known as disposable subcutaneous acupuncture needle with plastic tube, as shown in **Figure 2** and **Table 1**.

4.2.1.2.7 Use and storage of FSN acupuncture needles

The FSN acupuncture needle is a presterilized product for disposable use. Please do not use once the package is damaged. After opening the package, you must make sure that the surface of the needle is bright and clean, the needle is not rough and defective, the casting tube is transparent, and the needle is sharp. If any problem is found, please stop using it and notify the manufacturer immediately.

The FSN acupuncture needle should be kept in a dry, cool area.

4.2.2 Body position

Common body positions are as follows:

- a. Supine position: Mainly suitable for the insertion points of the head, chest, abdomen, and upper and lower extremities.
- b. Lateral position: Mainly suitable for insertion points on either side and upper and lower extremities of the body.
- c. Prone position: Mainly suitable for the insertion points on the head, back, hip, and lower extremities. A pillow is placed under the patient's chest; the patient's hands are folded on the forehead.
- d. Orthopnea position: Mainly suitable for the insertion points of the neck, shoulder, upper back and upper extremities, the knees, and the lower extremity regions.
- e. Sitting with head down position: Suitable for the insertion points of the occipital and upper neck regions.

4.3 Disinfection and needle insertion

4.3.1 Disinfection

Sterilize the local skin: Routine skin disinfection.

	Solid needle(mm)	Soft tube (mm)
Length	52	49
Diameter	0.6	1.05

Table 1.
The size of the FSN acupuncture needle.

Sterilize the upper part of FSN inserting device: Use alcoholic cotton to clean the upper part of FSN inserting device.

4.3.2 Needle insertion

After removing the plastic protection tube, place the needle into the inserting device; make sure the side with protuberance (with dots) is facing upward, and then pull the groove back to the load situation. Hold the device with middle finger at the bottom of the device, index finger on the red trigger button, and thumb on the top, as shown in **Figure 4**.

Place the upper part of FSN inserting device on the disinfected skin of inserting point; the angle between the device and the skin should be as small as possible. With the cooperation of the left hand, the operator presses the trigger button, and then the needle penetrates quickly into the subcutaneous layer as shown in **Figure 5**.

With the left index finger and thumb holding the needle, pull the needle out of the groove, and then the right hand withdraws the inserting device as shown in **Figure 6**.

4.4 Manipulation and sweeping

4.4.1 Manipulation

After inserting the needle, if the needle is directly inserted into the muscle, the patient will feel soreness, and the practitioner's hand that is holding the needle may also feel the resistance at the same time. In this case, the practitioner should pull the needle handle with the thumb, index finger, and middle finger slowly backward out of the muscle layer and back to the subcutaneous layer.

After confirming the needle tip is inside the subcutaneous layer, the practitioner can put down the needle body, and then prepare for the manipulation. During which, the practitioner holds the needle with the right hand and pushes the needle forward along the subcutaneous layer. It is better to raise the needle tip slightly up when pushing so that the tip is slightly tilted, making sure the needle does not penetrate into the muscle layer. When the needle is being pushed forward, the skin is lined up. During the process, if the patient feels sudden tingling or the practitioner feels sudden resistance, it is usually because the needle tip penetrates the blood vessel wall. Therefore, the needle manipulation process should be as slow as possible. When the practitioner feels the resistance before the patient feels pains, it is better to quickly withdraw the needle slightly, and then adjust the needle direction upward or downward to avoid causing pains to the patient.



Figure 4.
Gesture for holding inserting device.



Figure 5.
Before inserting the needle, the positional relationship between the inserting device and the skin.



Figure 6.
After inserting, the right hand is fixed, and the left hand pinches the needle.

Generally, it is suggested to go as deep as all soft tube being under the skin. In some other cases, if the needle is inserted near the side of the finger joint or other facet joints, the soft tube need not be fully embedded subcutaneously.

4.4.2 Sweeping movement

4.4.2.1 Manipulation

When the needle is in the correct position, with the left hand fixing the soft tube seat, the practitioner can use the right hand to recede the core needle and fix the protuberance of the soft tube seat in the slot of the core seat. At this time, the needle tip is no longer exposed outside but has returned to the soft tube, almost in line with the soft tube.

Then it is ready to perform sweeping movement. The inner nail margin of the right thumb and the middle finger is used to hold the core base, the index finger and the ring finger are separated on the left and right sides of the middle finger, and the tip of the thumb is fixed on the skin as the fulcrum. The index finger and the ring finger sweep in a seesaw-like sector one after the other. The scope of sweeping movements is better to be as large as possible, with stable speed and enough power, and sweeping rhythm should be slow so as to avoid the feeling of numbness, swelling, and pain. During the sweeping process, it is suggested to use the right hand to operate, while the left hand cooperates with reperfusion approach (**Figure 7**).

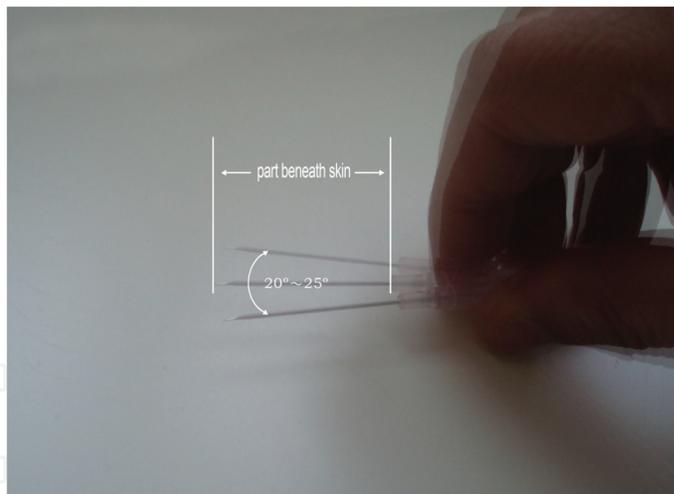


Figure 7.
The swaying movement.

4.4.2.2 Types of sweeping movement

According to different ways of swinging the needle, the sweeping movement is divided into the following two categories:

- a. Horizontal sweeping movement: The sweeping action of the needle tip is at the same horizontal level, which can save strength and is used more often. It can be used in most cases. Right now, with the cooperation of reperfusion approach, horizontal sweeping is mostly used during clinical practice.
- b. Sweeping movement in an elliptical circle: The solid needle moves clockwise or counterclockwise under the skin to perform a circular or oval movement, applicable for intractable diseases (see **Figure 8**).

4.4.2.3 Time and frequency of sweeping movement

Each needling point can be swept for 2 minutes with a frequency of 200 times per minute. Practitioner can check and assess muscle tension after 30 seconds of sweeping.

4.5 Reperfusion approach

During the FSN manipulation, reperfusion approach targeting PTMs is accompanied.

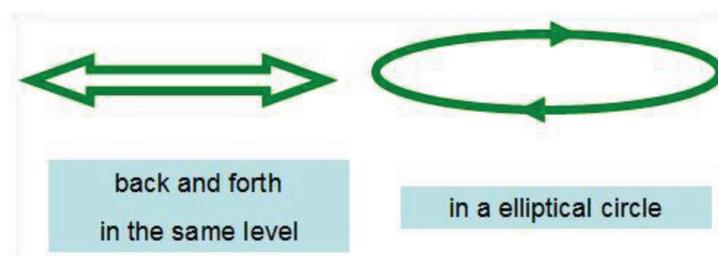


Figure 8.
Types of sweeping movement.

4.5.1 Classification of reperfusion

Active reperfusion refers to a reperfusion approach that is completed by the patient without assistance.

Passive reperfusion refers to a reperfusion approach that is completed by patients through reliance on external efforts.

4.5.2 Operational requirements of reperfusion approach

4.5.2.1 Range (as wide as possible)

According to the anatomy of the muscle and its functional activity, the practitioner should guide the patient to achieve maximum radius of the muscle (isotonic contraction) or maximum intensity of the muscle (equal length contraction).

4.5.2.2 Slow speed

A pause of 1–3 seconds is required during the maximum radius and the maximum intensity and relaxation. It is recommended to complete a reperfusion approach at around 10 seconds.

4.5.2.3 Less number of times

The same group of reperfusion approach, which refers to activity at the same direction and the same angle, should not be repeated more than three times.

4.5.2.4 Length of interval

A half hour interval is required between two groups of reperfusion activities so that the muscles could get enough relaxation.

4.5.2.5 Changes

Some targeted changes could be made in the reperfusion approach for intractable pains.

4.5.3 Operating methods of reperfusion approach

Reperfusion approach is different in different parts of the body. During clinical practice, Reperfusion approach should be designed according to joint features and the distribution of TMs related to targeted diseases:

- a. Neck: Six main movements are recommended, including lowering head, raising head, turning head to the left or right side, revolving head, and so on.
- b. Shoulder: Combing hair, trying to reach scapula of the same side, raising arms, and so on.
- c. Waist: Holding head with hands and bowing forward on the treatment couch, flying fish posture, twisting butt from left to right, stepping movement on the same position, voluntary cough, and so on.
- d. Knee: Flexion and extension, stepping movement on the same position.
- e. Chest, back: Taking deep breath, voluntary cough.

4.6 Retaining and removing of the soft tube

When the sweeping movement is finished, the solid needle can be taken out and placed into the protective sleeve. Put a piece of adhesive tape to cover the tube seat, and fix it on the skin. Make sure that the adhesive tape can cover the entire soft tube so that the soft tube kept under the skin can be fixed.

4.6.1 Time length for retaining the soft tube

It is usually suggested to retain the soft tube for 1 hour, and the retaining time can vary according to different clinical situations. Doctors can decide the retaining time by taking into consideration factors like weather conditions, patient's reaction, and severity of disease. If the weather is hot, the patient sweats easily, or the patient has itching feeling around the needling point or surrounding area due to allergic reaction to the adhesive tape; the retaining time is better not to be long; otherwise, the retaining time can be longer.

4.6.2 Remove the soft tube

To remove the soft tube, use the left thumb and index finger to fix surrounding skin of the needling point, then hold the soft tube seat with the right thumb and index finger, and take it out gently and slowly. Use a sterile cotton ball to press the needling point so as to prevent bleeding. After removal of the soft tube, patients can leave after a short break.

4.7 Time intervals and treatment course

4.7.1 Time intervals

Chronic diseases can be treated on a daily basis for two–three continuous treatment, and then the time interval can be prolonged to 2 to 3 days between two treatments. For other problems, the time interval can be decided according to the treatment effect.

4.7.2 Treatment course

Three times of treatment are usually considered as a course of treatment.

5. Exception and its handling

5.1 Subcutaneous bruises

A small amount of subcutaneous bleeding and local small pieces of bruising will disappear and recover automatically; generally no special treatment is needed. But practitioners need to explain to the patient so as to eliminate the patient's worries and fears.

If the local swelling and pain are obvious or the bruised area is large and affects functional activities, practitioners need to withdraw the needle immediately and apply cold compresses to stop bleeding. After 24 hours, hot compress and mild massage can be applied to promote the dissipation of blood stasis.

5.2 Fainting during the treatment

5.2.1 Prevention of fainting during treatment

It is better to explain thoroughly to the patient so as to eliminate the patient's worries, choose the right position, and treat the patient in a gentle way. If the patient feels hungry and tired, treatment can be given after the patient finishes eating, drinking, and taking a rest. Supine position is recommended when patients feel too nervous. Practitioners should observe the patients' responses and ask about their feelings. If the treatment causes discomfort and the patient shows symptoms of fainting, the practitioner should stop immediately and take some necessary measures in advance.

5.2.2 Management of fainting during treatment

The needling operation should be stopped immediately. The practitioner should withdraw the needle, help the patients lie on bed, and keep them warm. Generally, the patient will recover soon after drinking warm water or sugar water and taking some rest. If the patient is still unconscious or breathing weakly, or his or her blood pressure drops rapidly, other rescuing measures or first aid treatment should be carried out.

6. Precautions

- It is suggested to give a brief explanation to patients about FSN manipulation and its features before giving treatment so as to reduce the patient's fear and doubts.
- For patients who are aged and weak, the first time to receive FSN treatment and patients who are scared of needles, it is suggested to treat them by supine position.
- When giving reperfusion approach, the scope of activity should be from small to large, step by step, and the external force given from outside should be from light to heavy. The external force should be counterforce when patients move actively. A sudden force or vigorous activity is forbidden when giving passive activity. Age, physical, mental state, and other factors of patients should be considered when practitioners design the reperfusion activities. It is better to avoid the situation that one single reperfusion approach takes too much time, too much strength, or is repeated too frequently.
- During the period of retaining the soft tube, patients should keep adhesive tape clean and dry so as to avoid infections. Mild activities are suggested during the retaining of the soft tube, but strong and large movements should be avoided in order not to affect the fixation of the soft tube. In some rare cases, if the retaining tube reaches the blood vessels, resulting in stinging or bleeding, the tube should be taken out immediately. Do not be worried if patients feel itchy around the tube-retaining area, as it is usually due to allergic reactions of patients to the soft tube or adhesive tape. Practitioners can choose other kinds of materials instead to fix the tube, for example, bandages can be used.
- Practitioners should not perform FSN therapy on the abdomen of women within 3 months of pregnancy. Even for women who are pregnant over

3 months, it is better not to conduct needling on the lumbosacral region and abdomen. If pregnant women are nervous, it is forbidden to do needling treatment.

- If patients use safflower oil, massage milk, and other stimulating drugs for external use on their skin or receive treatment of strong plaster, strong cupping, and scraping method, FSN therapy should not be applied in a short time. But if the skin condition has returned to normal after these treatments, then it is suitable to do FSN therapy.
- It is better not to give FSN therapy to people who have recently received steroids injection therapy.

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