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RESEARCH ARTICLE

Myo-fascial pains in Muscular Dystrophy and Neuro Acupuncture

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ABSTRACT:

Objective of the paper: To show the interest of neuro-acupuncture in the treatment of muscle pain in Muscular Dystrophy Diseases.

Background: The practice of neuro-acupuncture dedicated to out bed patients in a department of Physical Medicine and Rehabilitation (Rothschild Hospital, Paris, Assistance Publique -Hôpitaux de Paris).

Material and method: Neuro-Acupuncture is a simplified form of Acupuncture adaptated to scientific medicine, associating dry needling and *deqi*. Our experience has been acquired with 20 patients suffering from Muscular Dystrophies.

Result: In front of the diversity of clinical features, Neuro-acupuncture allows adaptation to each patient at each session. Benefit is improvement in pain, equilibrium, walking and quality of life.

Discussion and conclusion: The application of this technique requires a lot of meticulousness in the clinical examination and in the placement of the needles for maximum efficiency. The benefit on pain is significant, immediately and over time.

Keywords: Muscular Dystrophy, Acupuncture, neuro-acupuncture, myofascial trigger point, dry needling, *deqi*.

Introduction

Patients with muscular dystrophy suffer from pain which is often poorly or insufficiently improved by analgesic drugs. Neuro-acupuncture, a modernized form of traditional Chinese acupuncture, may be an effective response, often superior to analgesics. It involves placing acupuncture needles at myofascial trigger points, i.e painful musculo-aponeurotic knots, with spontaneously pain or upon palpation. Our experience is based on a series of 20 patients (see Index 1).

We will successively expose pain in muscular dystrophy, trigger point concept, dry needling technique, and a combined intramuscular stimulation procedure with *deqi sensation* experienced both by patients and the acupuncturist, the course of an acupuncture session, and 5 clinical cases of muscular dystrophy, selected for their representativeness of the benefits of pain treatment. A discussion closes our paper.

Muscle pain in muscular dystrophy

In muscle diseases, the motor unit is affected. In these diseases, pain often takes second place motor deficits. However, the frequency of pa phenomena and their negative impact have oft been reported.

In a study [1] carried out on 68 adult patients se in a multidisciplinary expert center of hereditc myopathy, 46 patients (including 16 types 1 anc myotonic dystrophies, i.e., 67% of the participa who responded to the questionnaire) suffered fr chronic pain.

According to a survey of 511 patients w neuromuscular diseases, commissioned by the Frer Muscular Dystrophy Association (AFM Teletho and conducted by the team at the Center Pain Relief (CHU Saint-Antoine, AP-HP, Paris, France) [2] 67% reported pain in the three months preceding the survey. The average intensity was 4.8/10 and the pain was more often intermittent than continuous. This study highlighted the importance of this phenomenon and encouraged better assessment of pain in the long-term management of this type of disease.

According to an American study (pain questionnaire) of 235 patients with facioscapulohumeral muscular dystrophy (FSHD) or myotonic dystrophy type 1 (DM1), pain is also a frequent symptom [3]. Chronic pain was more frequent in FSHD than in DM1 (82% vs 64%). The pain was preferentially located in shoulders and hips in FSHD patients, whereas it was more located in the extremities (feet, hands) in DM1 patients. Usual painkillers were generally not very effective.

The concept of myofascial trigger points

Janet Travell and David Simons [4, 5] developed the concept of myofascial trigger points and associated referred (or radiating) pain. They wrote two fundamental books for treating patients suffering from musculoskeletal pain. Trigger points are muscle bundles that are firmer when palpated, where finger pressure triggers a dull, diffuse pain, sometimes radiating at a distance, identical or similar to patient complaint. These concepts were initially developed to understand muscular pain in healthy subjects with overused muscle or after muscle injury and muscular lesions. These two authors also described a sharp, local contraction (twitch response), which is a local muscle contraction triggered by palpation of the trigger point.

These bundles of spontaneous and/or palpation-induced pain are now considered to be muscle regions related to a state of contraction (taut band) chronically persists while the rest of the muscle is at rest (Figure 1).

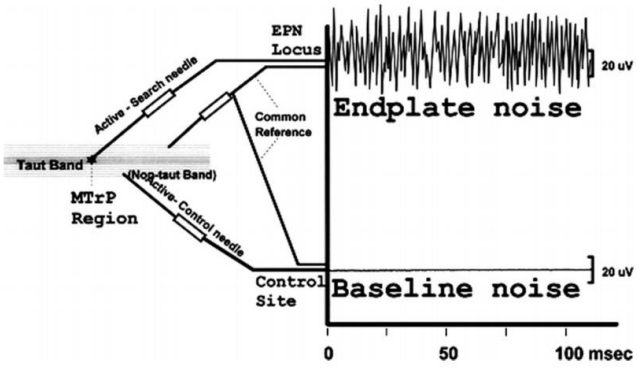

Figure 1: At the level of the myofascial trigger point, in the muscle at rest, the electromyography needle records persistent activity while there is no electrical activity around it (EPN: End Plate Noise; MTrP: Myofascial Trigger Point) [6].

Acupuncture points and myofascial trigger points

There are 365 acupuncture points. It is not unusual that some locations of trigger points are similar. Melzack listed 70% of similitude [7]. In our practice, it is palpation that determines the location of the puncture, and not the fact that it is a Chinese acupuncture point.

Neuro-acupuncture: dry needling combined to *deqi* sensation

Dry needling differs from treatments involving injections or "wet needling" (anti-inflammatories -

anaesthetics - combination of the two, botulinum toxin). Needling does not refer to the mapping of acupuncture points, unlike traditional Chinese or energetic acupuncture. This form of acupuncture, which is particularly well suited to musculoskeletal pain, is spreading in North America, Europe and even China [8].
Its main indications are musculoskeletal system disorders [9].

Searching for *deqi* sensation

Searching for *deqi* (得氣, grasping Energy or Breath) is a manoeuvre learned from traditional Chinese acupuncture. It involves applying a vertical movement to each needle, combined with alternating rotations, until the needle is 'hooked' by the tissues it passes through (Figure 2).

Figure 2: Puncture and searching for *deqi* in a patient suffering from pain in both shoulders (autoimmune myasthenia gravis).

The *deqi* manoeuvre involves grasping the needle in the subcutaneous tissues, mainly the collagen fibres. Thanks to this manipulation, a loop is closed: pain known, felt and expressed by the patient, pain found on palpation by the examiner and pain provoked by the search for *deqi* (Figure 3).

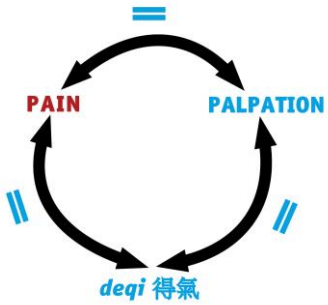

Figure 3: Careful palpation of the muscles detects the myofascial bundles responsible for the pain felt by the patient, as does manipulation of the needle (*deqi*). When spontaneous pain, pain detected by palpation and pain caused by *qi* manipulation are identical, the loop is complete. This guarantees the effectiveness of the treatment.

The practice of acupuncture and neuro-acupuncture in physical medicine is still very limited in Western countries. However, our experience shows that it is often superior to level III pharmacopoeia analgesics. We have extended the indications to spinal pain (from the cervical spine to the sacrum), scoliosis in the elderly, neuromuscular diseases, certain forms of amputation pain and spastic pain (post cerebral vascular accident, multiple sclerosis) [10].
As described by Travell and Simons, we carry out meticulous palpation in search of painful tissue structures. A needle is inserted at each hyperalgesic point. Neuro-Acupuncture is acupuncture guided by the clinic and palpation. It is based on current scientific medical knowledge rather than on the concepts of Traditional Chinese Acupuncture. **Western medicine is the reference, the acupuncture needle is the tool.**

Course of an acupuncture session

The acupuncture session takes place in the following stages:
1. Description of the pain(s) by the patient (clinical and para-clinical context, assessment of the pain using the numerical scale, locations and radiation, assessment of previous treatments and reactions).
2. Meticulous digital palpation to distinguish between skin and subcutaneous space (palpate-roll), muscles and other joint or visceral pains.
3. Insertion of the needles at the points triggering the pain: 'loco dolenti' or *Ashi* point (阿是穴, *ashi xue*, a concept from classical Chinese acupuncture, which can be translated as "this is where it hurts").

4. Finding the *deqi* sensation Initially painless, this action triggers gradually increasing pain. It quickly becomes intolerable. Obtaining the *deqi* sensation guarantees the effectiveness of the puncture. With the repetition of sessions, a patient-practitioner connection is created via the perception of the manipulation of the needle. This improves the treatment accuracy. Depending on the circumstances, certain classical Chinese acupuncture points are used. Each session lasts approximately 30 minutes.

Acupuncture sessions are part of an overall physical medicine and rehabilitation care.

Massages, stretching and muscle strengthening, work on balance, walking and endurance have immediate benefits, but also later on over the long term, if the patient regularly practises the self-maintenance exercises learnt during staying in the Rehabilitation Day Hospital.

Whenever possible, some patients also benefit from the regular and complementary practice of Indian yoga or yoga stretching, Qigong or Chinese Taijiquan.

Five clinical cases demonstrating the effectiveness of neuro-acupuncture

The acupuncture sessions were carried out on 20 patients suffering from various forms of myopathy (Index 1, in order of frequency: facioscapulohumeral myopathy, limb-girdle myopathy, myasthenia gravis, myopathy with atypical diagnosis, or without a precise diagnosis, inclusion myositis, spinal muscular atrophy, Emery Dreyfus laminopathy, scapuloperoneal myopathy-FHL1-related, calpaïnopathy, myotonic dystrophy or Steinert's disease.

Symptoms manifestations were very heterogeneous, even among patients with the same diagnosis [11]. Acupuncture can be adapted to each clinical case and its evolution (number of needles, location, frequency of sessions, etc.).

Atypical myopathy

A young woman aged 34, with onset of neuromuscular deficits at the age of 10, T1-L3 arthrodesis at the age of 21, then de-arthrodesis two years later. She had been suffering from left back pain for over six months with no benefit from analgesic medication. Sarcopenia made it was difficult to find trigger points, but a point was located near the inferior angle of the left scapula (Figure 4). Repeated puncture gradually improved the symptoms until the disappearance of back pain.

Figure 4: Palpation and tracking the trigger point responsible for back pain. Difficulty to find and to insert acupuncture needles due to amyotrophy.

Emery-Dreifuss muscular dystrophy

A 32-year-old patient with this particular form of dystrophy already had a heart transplant. He was prescribed statins after a blood test revealing an increase in cholesterol. This drug triggered a series of acute muscular pains that were partially resolved when the drug was stopped and prescription of painkillers. Residual pain persisted in the left half of the back. Applying needles to the painful points (found by palpation) reduced the pain at the first session, with relief being consolidated by a second session (Figure 5).

Figure 5: Patient with Emery-Dreifuss myopathy and suffering pain after taking statins.

Facioscapulohumeral muscular dystrophy

This is the most common disease in our series (n = 7/20).

Among the patients, a 43-year-old male dentist with a classic topography of muscular involvement

(deficit of the trapezius and other stabilisers of the scapula). He rated his current pain intensity up to 8/10 in the afternoon, associated with severe fatigue. Acupuncture was performed in the context of a day hospital stay, during which the patient learned self-maintenance techniques, which he then performed on a regular basis. The benefits of the rehabilitation were undeniable, enabling a relative but real strengthening of the muscles. The effect of acupuncture was judged on the level of background pain, which fell from 5/10 to 2/10, without significantly altering the peaks linked to professional fatigue, rated at 8/10 (Figure 6).

Figure 6: Puncture of trigger points of the trapezius, angular scapular and rhomboid muscles. Shot taken during an acupuncture session, during a lifting effort by pushing on the hands. It highlighted the weakness of the shoulder stabilizers.

Another example of facioscapulohumeral muscular dystrophy

A man aged 64. A former parachutist (aged between 18 and 24), used to practising gymnastics and jogging, he presented weakness in both arms at around the age of 40, followed by problems with walking, predominantly in the levator muscles.
Diagnosed at 42 with FSHD myopathy (muscle biopsy) affecting the whole body. Now aged 63, he has been receiving acupuncture for 4 years.
His walk was waddling, with his shoulders thrown back (sometimes with his hands crossed behind his back) and presented a very high hyperlordosis, over a distance of 5 to 10 steps followed by a pause. After acupuncture (Figures 7 and 8), he can take 10 to 20 steps. The pain was located in the lumbosacral hinge and was mainly triggered by walking: before acupuncture he rated pain intensity up to 8-9/10, and after 2-3-4/10. The patient continued to practice daily the self-maintenance movements learnt in the Day Hospital.

Figure 7: Patient with FSHD, lumbosacral hinge pain rated up to 8-9/10 improved by local acupuncture (2-3-4/10). The walking perimeter increased from 5-10 steps then pause, to 10-20 steps then pause (inconstant use of a simple cane).

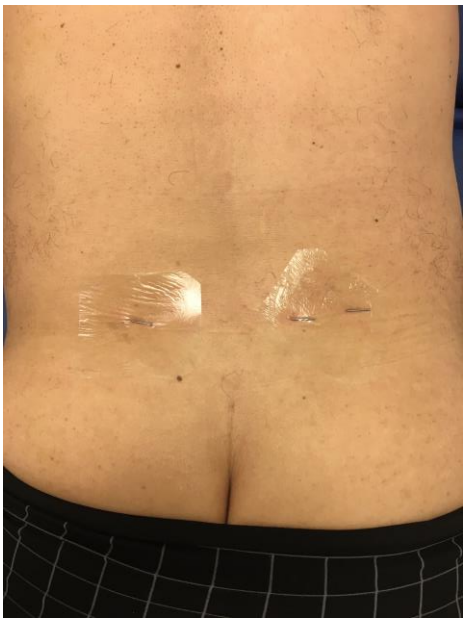

Figure 8: The needles inserted during the session (perpendicular to the skin) were replaced by shorter subcutaneous needles, inserted tangentially. They were semi-permanently inserted under a plastic film for a period of several days to a maximum of two weeks. So, the analgesic effect was extended.

Clinical case N° 5

Female patient aged 40 suffering from calpaïnopathy. The perimeter is reduced by weakness and muscular pain: possible alone, 200-

300 m, without cane, but most often supported on the arm of a companion. She stumbled onto the ground once a month. Climbing stairs was difficult, asymmetrical, with help from the handrail. She stopped taking Lyrica because of weight gain. The pain was in the lower limbs, especially in the quadriceps, rating at 8/10.

After the first acupuncture session, which was limited to the quadriceps, the pain was reduced to 3/10. In a second phase, the acupuncture treatment was extended to both legs: the reduction of pain in the thighs had brought pain in the legs in the foreground.

Figure 9: Female patient with calpaïnopathy. The shape of the calves is characteristic. The pain was predominant in the quadriceps (3 needles each). One needle in each triceps medial head (not visible in the photo) and one on an acupuncture point (right, *san yin jiao*). The pain was sedating after the first acupuncture session.

Discussion

In the treatment of chronic myofascial pain, acupuncture treats both the cause of the pain and the pain signal sent by the tissue lesion, as well as the memory of this signal in the pain centres of the central nervous system.

Acupuncture points and meridians

Mapping points and meridians [12] can be used as a working hologram. But the location of the punctures depends on palpation and the patient's sensation of the *deqi*. The *deqi* is very useful in the accuracy of the puncture points.

365 acupuncture points (plus those outside the meridians) cover the body. It is logical that 70% have the same location as the trigger points [7 op.cit.].

Action mechanism of acupuncture

A great deal of scientific research over the last few decades has led to a better understanding of the mechanisms by which acupuncture needles work. Here are a few examples:

Studies on rabbits showed a significant ($p<0.05$) increase in serum beta-endorphin and spinal enkephalin levels [13, 14].

In addition, brain imaging studies have shown the impact of repeated acupuncture sessions on brain connectivity: periaqueductal grey matter, medial frontal cortex and bilateral hippocampus [15].

Myofascial trigger points

This is an evolving concept. More practitioners and researchers are becoming involved in clinical assessment and understanding the mechanisms behind the pain experienced by patients [16]. A wider field of application, more precise and documented indications, and better-evaluated results will continue to advance common know-how and benefits for patients. It should be borne in mind that there are as many varieties of myofascial trigger points as there are forms of pathology at their origin [17].

In muscular dystrophy pain, knowledge about the myofascial trigger points and treatment by neuro-acupuncture is still at the beginning. Literature in this field is rare and needs to be developed.

Deqi sensation

Understanding the role of needle manipulation is the subject of intense research [18]. Searching for de*qi sensation* is essential to the therapeutic effect of acupuncture and is a key to understanding its mechanisms of action. According to Langevin [19, 20] needle grasping is due to the mechanical coupling between the needle and the connective tissue, with the tissue wrapping around the needle during needle rotation. In addition, this manipulation transmits a mechanical signal to the connective tissue cells by mechanotransduction. This could explain the local and remote effects, as well as the long-term effects of acupuncture.

The depth of the needles is guided by the search for *deqi* sensation Obtaining a "twitch response", a brief muscular reaction to the puncture, is a guarantee of the accuracy of the treatment.

Sarcopenia

In muscular dystrophies, myofascial trigger points can be difficult to detect because of sarcopenia. A gentle and meticulous palpation as well as a certain practice are required.

Assessment

Neuro-acupuncture, which focuses on the painful tissue structures, is effective, as demonstrated by the way patients feel: less pain, less fatigue, better balance (fewer falls), more efficient walking with a longer walking perimeter and, overall, a better quality of life. These benefits are also reflected in the development of pain ratings based on a numerical scale.

Clinical diversity and adapting the application of acupuncture needles

The same diagnosis may cover a wide range of clinical situations. For example, FSHD myopathy is sometimes limited to the shoulder girdle (case 3) but can affect the whole body (case 4). It is sometimes difficult to distinguish neuromuscular disorders and common diseases (back pain, lumbago, etc., cases 1 and 4).

The location of the acupuncture needles is adapted to each session. The acupuncturist's actions involve him more in the painful patient's symptoms, where palpation is a key element, and more essential than prescribing drugs.

Frequency of acupuncture sessions

Some patients only need a few sessions (cases 1 and 2). For others, sessions are repeated every few weeks to months. For some patients, acupuncture is the sole analgesic treatment. For others, it is combined with other complementary treatments.

To prolong and maintain the benefits of the neuro-acupuncture sessions, we sometimes replace the acupuncture needles at the end of the session (perpendicular to the skin, between 45° and 90°) with new, shorter needles (18 mm subcutaneous length) implanted parallel to the skin folds so that they can be supported during skin movements (clinical case 4).

Contraindications, side effects

The only contraindication we have encountered is fear of needles (1 case, not included). There are no side effects. There may be an exacerbation of pain for a few hours, but this is caused more by palpation for searching myofascial trigger points than by puncture or the search for *deqi* sensation.

Conclusions

Acupuncture, which was "soft medicine" fifty years ago (or even alternative medicine!), has now become "hard medicine", with indications in a wider range of clinical fields.

Neuro-acupuncture, a Westernized-form of Chinese acupuncture, is simplified and based on a scientific understanding of the use of needles. It can be used as a new therapeutic proposal for treating chronic pain in patients with muscular dystrophies. It is a physical, non-medicinal treatment, particularly suited to patients for whom analgesic treatments have proved insufficient or ineffective. It is based on the concept of the myofascial trigger point, initially developed for understanding and relieving pain of the musculoskeletal system. Unlike drugs, it has few side effects. Determining which points to 'puncture' requires skill and attention to detail. Inserting and manipulating the needles is a subtle process: the needle must be seized by the subcutaneous tissues (*deqi* sensation). This form of dialogue *via* the sensations created by the needle needs to be learned by the patient. Since it is more effective than level III analgesics (opiates), can we talk about level IV?

Neuro-acupuncture is a therapy that is integrated with other treatments in physical medicine. It should be practiced by more doctors to better evaluate its action, validate its efficacy, and diversify its indications.

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Index 1: List of neuromuscular diseases treated by neuro-acupuncture in our series of 20 patients

Facioscapulohumeral myopathy: 7 (OMIM 158900)
Limb-girdle muscular dystrophy: 3 (more than thirty forms of LGMD have been identified to date. LGMD mainly affects the proximal muscles, i.e. the muscles of the shoulders (scapular girdle) and hips (pelvic girdle).
Myasthenia gravis: 2 (OMIM 254200)
Myopathy with no precise or atypical diagnosis: 2
Inclusion myositis:1 (OMIM 605820)
Spinal muscular atrophy: 1 (the Proximal Spinal Muscular Atrophy linked to the *SMN1* gene is the most frequent form. There are four forms of *SMN1*-related Proximal Spinal Muscular Atrophy, depending on age of onset and severity of symptoms).
Emery Dreyfus laminopathy: 1 (OMIM 606480)
Scapuloperoneal myopathy, FHL1-related: 1 (OMIM 300696)
Calpainopathy: 1 (OMIM 253600)
Myotonic dystrophy or Steinert's disease: 1 (OMIM 160900)