Thesis

Myofascial Release For Myofascial Pain Syndrome

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1.0. Introduction

MPS or Myofascial Pain Syndrome could be witnessed as one of the commonest musculoskeletal disorders which are caused by myofascial trigger points. Saying that, this should be noted the musculoskeletal disorders and sports-related injuries could often relate to muscles and their fascia. The aim of this paper is to elaborately discuss and evaluate a clinical case of myofascial injury having had presenting complaints of shooting pain in the right elbow alongside limited arm mobility in an 18-year-old professional baseball player.

2.0. Aetiology of MPS (Myofascial Pain Syndrome)

Although, the pathophysiology of MPS is poorly understood contemplating the intricate nature of pain in musculoskeletal system, it is hypothesized that certain areas of low-threshold nociceptor along with dysfunctional motor end plates, often branded as trigger points, are often associated with MPS. In tandem, the dysfunctional motor end plates could connect to a group of sensitized sensory neurons in order to transmit pain [Finley J., E., 2019].

The affected myofibrils could form a palpable taut band, while the taut bands could be resulted from a sustenance in contraction in fibrils due to an increase in release of Acetylcholine in the motor end plate. An increase in Ach in neuromuscular junction will increase Acetylcholinesterase level around the synaptic cleft [Gerwin, Dommerholt & Shah, 2004].

Apart from that, electrical diagnostic studies have found out that an abnormal increase in level of Ach would increase activities around the motor end plates, eventually leading to a constant state of hyperactivity and Ca^{2+} release around the motor end plate in case of Muscarinic 1 (M1) receptor, causing an initiation of action potential which would follow a contraction.

If a muscle twitch of unknown aetiology or a muscle contraction of unknown aetiology persists, this will lead to an increase in oxygen consumption in the affected muscle fibres.

The higher demand of oxygen will result in ischemia until blood flow is restored, while it is proposed that a substance called "P" could be behind the pain caused during muscle ischemia, hypoperfusion and hypoxia. However, the "P" factor is believed to be potassium ion (K^+).

An increase in K^+ will continue to result pain until either blood flow is restored or blood requirement is lessened. In case of angina, an increase in K^+ is observed while the pain is relieved in resting phase as blood requirement of heart is lessened. Identical occurrences were found in vascular occlusive diseases such as intermittent claudication.

Microscopically, a localized ischemia for a particular myofibril or myofibrils may cause muscle damage in some cases and trigger the release of neuro-vaso-reactive reactive substances like of prostaglandin, serotonin, adenosine, K^+, H^+ and bradykinin, while passively all of them alongside the factor "P" or K+ will actively lead to pain. [Gerwin, Dommerholt & Shah, 2004]

3.0. Signs and symptoms of patients with MPS

It is usual for patients with MPS to present complaints such as regional aches, diffuse and persistent pain in certain muscles and joints, while the pains' intensity could be of varying degrees ranging from mild to severe. Aside from that, patients may come in with history of dropping things from hands because of pain-related muscle weaknesses [Finley J., E., 2019].

Symptoms may follow trauma or injury in affected areas; however, patients' symptoms could be of gradual onset [Borg-Stein & Simons, 2012].

Usually neck and shoulder muscles are the most commonly affected areas (trapezius, sternocleidomastoid alongside scalene) alongside pelvic girdle [Alvarez & Rockwell, 2002].

Trigger points of pain or palpable taut bands in skeletal muscles could cause pain while compressing and could lead to referred pain, a tenderness that is felt remote to the origination of site 1, for example, pain from scalene muscle could be felt in hand.

Interestingly, myofascial trigger points of pain of different muscles could be separated by their patterns, hence helping a physician determine which muscles are affected by MPS [Borg-Stein & Simons, 2012].

To clarify further, difference between trigger points in clinical diseases like of fibromyalgia and MPS are entirely different. When it comes to fibromyalgia, pain occurs at the site of palpation and the pain is usually associated with sleep disturbance as well as fatigue. Besides, fibromyalgia also is characterized by an increase in cholinergic activities resulting symptoms such as abnormal sweating, increased salivation, increased & abnormal vasomotor response, increased pilomotor response as well as abnormal muscle tearing due to increased Ach level in motor end plate of affected muscle leading to an increase in contraction in affected myofibrils.

Paradoxically, it is hypothesized that the stimulation in autonomic nervous system is caused by activation of multiple sensitive nociceptors located surrounding the trigger points, however, often the activation leads to an overstimulation of sensory neurons, thus promoting pain [Chang-Zern, H., 2011].

Other associated neurologic symptoms could be paraesthesia, blurred vision, dizziness, tinnitus, trembling and numbness [Borg-Stein & Simons, 2012].

3.1. Classification of Trigger points

MPS trigger points could be classified into two categories such as active and latent based on their clinical characteristics.

- Active trigger point: Active trigger points often cause spontaneous pain as well as palpation with referred radiating pain [Finley J., E., 2019].
- Latent trigger points: Latent trigger points are also tender, but their key difference with active trigger points is that those are not spontaneously painful. Instead, those are often found in asymptomatic patients. Though, latent trigger points could limit movement and cause stiffness [Alvarez & Rockwell, 2002].

Numerous past studies had indicated that latent trigger points could be most frequently found in shoulder-girdle muscles of 45 per cent to 55 per cent asymptomatic young adults [Borg-Stein & Simons, 2012].

On top of that, it is also hypothesized that latent trigger points are a result of ill-treated active trigger points. Besides, muscle tensions, physical factors such as poor posture as well as psychological stress causing clinical problems like of restless leg syndrome could lead to MPS.

Multiple Muscle twitches, a single and spontaneous contraction in myofibril lasting less than 10ms, which are visible in naked eyes or being presented with LTRs (Local Twitch Responses) in affected muscles are another sign of MPS. LTRs are erratically produced contractions in the affected myofibrils, either within or around the taut bands.

Furthermore, patients with MPS are often found with limitation of movement and muscle weakness [Finley J., E., 2019].

The most burdensome complication of MPS is prolonged muscle inactivity which in turn could cause muscle atrophy, too [Chang-Zern, H., 2011].

4.0. Diagnosis of MPS

MPS is often overlooked and remains undiagnosed, while MPS is frequently subsided and the pains are thought to be resulted from complications of other diseases, or mechanical problems associated to bones, ligaments or tendons.

- Physical examination: A precise physical examination for MPS is required, while in palpation of musculoskeletal system, a trigger point could be located as a firm and hypersensitive nodule. Besides, the palpable trigger point could be associated to other complications like of paraesthesia, dysesthesia alongside localized tenderness in skin overlying the affect the muscle.
- EMG: In electromyography, an active group of nociceptors could be found in the tender nodules, while trigger points could be localized further by recording a reduction in skin resistance to electrical currents overlying the areas of affected muscle fibres. [Finley, J., E., 2019]

Nonetheless, at this standpoint, physical examination is performed for diagnosing MPS and no laboratory testing is believed to be confirmatory. Though, laboratory testing could reveal the predisposing factors of MPS such as hypothyroidism, vitamin deficiency as well as hypoglycaemia.

Trigger points, in tandem, could sometimes be linked to an increase in blood flows, while this could be detected in liquid crystal thermography. USG followed by needle penetration in the suspected region could be used to locate trigger points associated with MPS. [Finley, J., E., 2019]

5.0. Management of MPS

Management of patients with MPS is developed on the basis of eliminating chronic stress or overuse of affected muscles.

However, before reaching a particular treatment modality, a patient's posture, biomechanics as well as joint mobility and function should be carefully analysed, which in effect would help identify any kind of underlying factors contributing to the MPS.

There are several treatment modes including physical therapy, heat or ice therapy, oral analgesics and steroids, spraying or stretching, injection of local anaesthetics either around or in the suspected trigger points etc.

Non-pharmacological approaches include acupuncture, massage as well as transcutaneous electrical nerve stimulation [Borg-Stein & Simons, 2012].

Manual techniques

Usually, the decision on which treatment method will be adopted, depends on the severity of pain. Manual methods for MPS could be effective for patients with new and acute trigger points, while

patients with frets of needles or having pains in regions that could not be accessed or localized easily such as psoas, are also being treated with manual techniques. [Alvarez & Rockwell, 2002]

Stretching could be first line of treatment for patients since the method focus to relieve muscle tightness as well as shortening linked to MPS. [Borg-Stein & Simons, 2012]

Physical therapy targets stretching as well as strengthening of the affected muscle fibres. Besides, correction of improper postures is an important part of physical therapy. [Finley, J., E., 2019]

There are a significant number of manual methods such as osteopathic manipulation, myofascial release, counter-strain, high and low velocity manipulation alongside muscle energy.

All of these techniques are targeted to enhance and stretch out the ROM of affected muscle fibres.

Following stabilization myofascial pain as well as a restoration of ROM, patients are often encouraged to pursue a strengthening program, which frequently associates aerobic exercises in order to fend off future recurrences.

Another critical feature of MPS therapy is counselling of the patients alongside proffering sufficient scale of education regarding the efficaciousness of manual techniques, which in effect could help patients manage their own symptoms, too.

5.1. Trigger point injections

Trigger point injections (TPI) or dry needling became widely accepted over recent past as the treatment modalities have shown to have greater efficacy in relieving symptoms. Nonetheless, patients often become dependent on both opioid and non-opioid analgesic, which is why trigger point injection is used only for primary treatment of MPS. However, if other non-invasive treatment modes are exhausted,

TPIs might be necessary to manage chronic and persistent myofascial pain. [Borg-Stein & Simons, 2012]

When it comes to trigger point injections treatment modality for chronic or persistent pain in a patient with history of MPS, three consecutive visits are usually recommended, while symptoms are reassessed in order to determine whether further injections are required [Borg-Stein & Simons, 2012].

Apart from that, the efficacy of injections would largely depend on locating the site of maximal pain within the trigger point as well as provoking an LTR while inserting the needle.

Previous studies have found that the creation of an LTR during injection is widely associated with relief of pain as well as muscle tightness [Alvarez & Rockwell, 2002].

When it comes to deep muscles or LTRs which could not be detected by visual assessment, USG-guided trigger point injections are commonly used for locating LTRs [Rha et al., 2011].

Injections might include several medications or no medications at all. Besides, some trigger point injections include opioid analgesics like of bupivacaine, etidocaine, lidocaine as well as saline and sterile water [Borg-Stein & Simons, 2012].

Apart from that, inflamed areas could be treated with steroids as wells. Though, in recent days, BOTOX (botulinum toxin) is considered as a treatment mode for MPS due to its long-lasting effects to relieve pain.

Besides, drugs that lead to a decline in Ach concentration in and around the neuromuscular junctions could reduce muscle contraction and hyperactivity, eventually improving local ischaemia and leading to a restoration of blood flow, hence relieving pain [Borg-Stein & Simons, 2012].

Nevertheless, when injections are followed by manual techniques like of stretching, patient compliance could increase significantly.

Relief of pain could normalize muscle activity, enable muscle function alongside further inactivation of myofascial trigger points [Borg-Stein & Simons, 2012].

5.2. Dry needling

Dry needling often involves placing a needle without any substance and was found highly effective in treating pain.

Although it remains uncertain how dry needling actually function, but current hypothesis proposed that the pain is relieved by hyperstimulation analgesia caused by needle stimulation. Insertion of a dry needle usually exerts strong pressure to a sensitized nociceptor in the target area.

It is proposed that the nociceptor could offer strong neural impulse to sensory neuron in the spinal cord, that might just interfere with the trigger point pain pathway [Chang-Zern, H., 2011].

The process is rarely used due to post-injection soreness. Besides, if two or three injections are proved to be ineffective, reinjections are usually not practiced [Chang-Zern, H., 2011].

After undergoing TPIs, it is recommended to avoid strenuous activities for a certain period of time that may range between a few days to a few weeks, though patients are encouraged to stay active.

Complications linked to trigger point injections are rare, however, complications could arise depending on the location of the injection.

The complications of TPIs include local pain, bruising, infection, intramuscular haematoma formation as well as neurovascular injury [Alvarez & Rockwell, 2002].

Patients with MPS are frequently prescribed with NSAIDs as well as muscle relaxants. Though, the medications could only provide symptomatic relief. However, efficacy of NSAIDs as well as muscle relaxants are increased when used in conjunction with physical treatment of MPS [Finley, J., E., 2019].

5.3. Myofascial Release

Myofascial release is the most frequently used technique to treat MPS. As beforementioned, Myofascial pain syndrome might be characterized by chronic pain resulting from an increase in sensitivity as well as tightness in myofascial tissues.

Myofascial tissues support muscles throughout the body and they usually wrap up the muscles, however, pain in MPS is originated from NMJ (neuromuscular junction) in myofascial tissues, which are usually called as trigger points.

In the matter of the fact, myofascial release declines pain by relieving tension in trigger points, thereby reducing the chances of activating a mechanoreceptor, which in turn would have triggered a mechanical action potential and sent stimulation into myofibril through NMJ.

Besides, localizing a specific trigger point might be nearly impossible, since a group of myofibrils is usually innervated by a web of nerve endings, which are branches of a particular nerve and a particular nerve could innervate many regions and could be contemplated as referred pain while identifying a trigger point.

A conventional example of referred muscle pain from joints could be pain in knee in patients with osteoarthritis [Vecchiet et al., 1999].

If the pain is deep and non-localizing, a group of muscle could be affected and walking could be difficult. That is why myofascial releases often are used over a broad area or a group of muscles rather than a single point [Guide to Physical Therapist Practice 3.0., 2014].

6.0. Clinical case as a manual practitioner

Patient information: 17-year-old male. Elite baseball player.

Patient History:

18 days ago in his baseball batting training, he was hearing popping sound from around upper right ribs and shooting pain came up to right elbow. Since then he cannot throw ball at all due to pain and it has been even difficult raising right arm in his daily life.

He received treatments by chiropractor, physiotherapist but the pain did not change.

No any clinical findings by X-ray and ultra sound. MRI will be scheduled by his sports medicine doctor.

Objective Findings:

Pain Scale:

The patient reported the right arm shooting pain to elbow as a 4 out of 10 and the pain is 10 out of 10 at it's worst, and 0 out of 10 when it's rest. The pain is only with particular movements.

Neck

- Jackson's Compression Test (-)
- Spurling's Test (-)
- Shooting pain to right elbow (+) with flex with side flexion to left

- sNo reflex changes, weakness
- Swelling (-), Heat (-), Redness (-), Bruise (-)

Right arm

ROM:

No any pain or limited motion on right shoulder, and the right arm has full range but it has shooting pain to elbow that starts at the range below.

- Right arm abduction: Right arm shooting pain with 4 to elbow with abduction at 60°
- Horizontal internal rotation at 20°with pain 6
- Horizontal external rotation at 20°with pain 6

Trigger points

C4-5 right multifidus, pectoralis major and minor, subscapularis, terres minor

Treatment Plan:

He has not been taken any treatments for athletic conditioning or injury prevention regardless of elite athlete in high intensity trainings. And some particular myofasciae are very tight and contracted by chronic overuse. From the objective findings, the pain appears when these contracted trigger points are

stretched. I assume the symptom comes from referred pain of the trigger points and fascial adhesions.

Treatment was done by:

- Myofascial Release for breaking down fascial adhesions
- Deep fascial release with released position

Treatment: Length: 40 min

1) Supine deep myofascial release with released position for C4-5 right multifidus
2) Supine deep myofascial release with released position for subscapularis
3) Lateral recumbent myofascial Release for pectoralis major
4) Lateral recumbent deep myofascial release with released position for pectoralis minor
5) Prone deep myofascial release with released position for terres minor

Frequency: 2 times per week for 3 times

Results of 1st treatment

ROM without pain:

- Abduction 60°→full 100% better
- Horizontal internal rotation at 20°→30°

- Horizontal external rotation at 20°→30°

Prognosis

Treatment decreased pain and improved range of motion. After 3rd treatment, the ROM without pain was 0. After the 3rd session he went back in his baseball training in United States and could not see the following process.

7.0. Conclusion

MPS is an extremely common cause of chronic musculoskeletal pain. The process of this case was successfully improved and Manual Osteopathy techniques, in particular some types of myofascial release, could prove to be dramatically effective for trigger point. These trigger points could be hidden and difficult to find. Practitioner should always investigate the underlying reason for active trigger points. Myofascial release for deep trigger points can be painful for the patient. The practitioner should consult about the issue before beginning the treatment procedure and a higher level of monitoring skill is required at the point of contact, so the practitioner can sink in to find the exact spots precisely with appropriate stimulation. The practitioner must decide about the depth in which they need to apply the treatment procedures. If the process to reach the depth might be painful for the patient, it should be consulted as beforementioned. Depth of the tissues of concern could vary from area to area depending on the degree of damage. In order to have a better result, practitioners should keep practicing to improve their manual technique skills.

Patients must be addressed and evaluated on a regular basis until symptoms are over. MPS, in simple term a musculoskeletal disorder, must be apprehended with caution and the patient must not ignore the pain since it could become more burdensome as the disease progresses. In tandem, as chronicity of the illness increases, even symptomatic relief could be difficult to yield without invasive treatment. The best

prognosis in treatment of MPS could be found only if the treatment begins at an earlier phase. Aside from that, removing the aggravating factors are critical, too.

8.0. References

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