The outcome of instrument-assisted soft-tissue mobilization in conjunction with functional training in a patient with chronic regional pain syndrome post-supraspinatus arthroscopic repair

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ABSTRACT

Chronic regional pain syndrome (CRPS) is a condition that shows extreme pain that is disproportionate in time and intensity. Instrument-assisted soft-tissue mobilization is a new range of tools that enable clinicians to efficiently locate and treat individuals diagnosed with soft-tissue dysfunction. Here, we report the case of a 50-year-old female who was diagnosed with high-grade partial articular surface supraspinatus tear which was surgically managed by arthroscopic repair. A thorough assessment revealed that there was a severe restriction of shoulder ranges and pain. She was into Stage I of CRPS. Usually, in CRPS, the mainstay of treatment is pain block or dry needling or painkillers such as nonsteroidal anti-inflammatory drugs and tramadol before starting the exercises. However, she was initially treated with instrument-assisted soft-tissue release and subsequently given functional training for the improvement in range of movements and control. There was not only a considerable improvement in her range but also a reduction in the pain within 12-week post-operative. Thus, we can conclude that instrument-assisted soft-tissue release and functional training not only helped to ameliorate her pain and improved the range but also gave her a sense of active involvement in her household chores.

Key words: *Arthroscopic repair, Chronic regional pain syndrome, Rehabilitation, Rotator cuff injuries, Soft tissue*

Chronic regional pain syndrome (CRPS) is a condition that shows extreme pain that is disproportionate in time and intensity. It is two types, namely, CRPS-I and CRPS-II. There is autonomic dysfunction with associated sensory, motor, vasomotor, and sudomotor changes. It is usually diagnosed with Budapest criteria [1,2]. Tanesue *et al*. showed in their study that CRPS occurs most commonly 3-month post-rotator cuff repair [3]. A similar finding was suggested by Harada *et al*., which states that about 29% of people undergoing rotator cuff repair develop CRPS [4]. Given these statistical evidence, it is of utmost importance to be able to formulate a thorough treatment protocol for the same.

Instrument-assisted soft-tissue mobilization is a new tool that enables clinicians to efficiently locate and treat individuals diagnosed with soft-tissue dysfunction. It is useful to breakdown the restrictions, we find in the fascia. It basically works on the principles of controlled microtrauma introduced to the soft tissue, which causes stimulation of local inflammatory response and thereby causing the reabsorption of fibrosis. It facilitates a cascade of healing activities and hence is effective to release triggers in muscles [5,6].

Since our case report is also based on a patient with a similar condition, we have highlighted the physiotherapeutic management given to this patient. It is unique because we have combined instrument-assisted soft-tissue release to release the triggers and inculcated functional activities in the form of exercises. The patient had CRPS, and usually, the mainstay of releasing the triggers and reducing the pain in this condition is either pain block or dry needling [7]. Both are invasive techniques. Furthermore, manual or hand release is very painful as CRPS is usually associated with hyperalgesia and allodynia. Thus, we have tried to use instruments or tools to release her triggers, which are non-invasive as well as not as painful as any of the above techniques, at the same time, it gave us good results in this particular case.

CASE REPORT

The case report has been compiled, keeping in mind the CARE guidelines. It is based on a 50-year-old female, who was a homemaker and right-hand dominant, diagnosed with a high-grade partial articular surface supraspinatus tear, for which she was surgically managed with arthroscopic repair on September 23, 2019. She was instructed to immobilize the extremity in a shoulder sling for 6 weeks. Thereafter, she was asked to go for physiotherapy sessions. She came to the physiotherapy department with the chief complaints of diffuse dull aching pain along with the entire right

upper extremity, particularly at the greater tubercle, infraspinatus belly, lateral epicondyle of the humerus, and dorsal aspect of the wrist joint. Visual analog scale (VAS) was taken to note the pain which was 3/10 at rest and 8/10 on any activity which involved moving the shoulder, elbow, and wrist in any direction.

The general examination revealed that there was generalized edema over her right upper extremity. She had a mesomorphic body type with body mass index of 22.5 kg/m^2. Her vitals were noted in the first session, which revealed that her heart rate was about 75 beats/min and her blood pressure was 126/82 mm Hg, which was well within the normal range; hence, it was not reassessed in subsequent sessions.

The patient had her basic as well as instrumental activities of daily living restricted. On observation, it was noted that she had a protracted shoulder posture with the right elbow maintained in about 30° of flexion even when the sling was removed. On observation, in standing, active shoulder flexion was about 20° compensated with shoulder girdle elevation and retraction. Active shoulder abduction was about 25° thereafter in scaption up to 40°. Shoulder internal rotation was 30° and external rotation was 0°.

On palpation, it was found that there were trigger points in the upper trapezius, levator scapulae, infraspinatus, rhomboids, supraspinatus, biceps, deltoid, brachioradialis, and extensor carpi radialis. The skin of the right upper extremity was shiny and there was allodynia. The patient was having CRPS Grade I as per the Budapest criteria [1]. There were swelling and pain in the small joints of the right hand.

The patient belonged to a fair socioeconomic class of society. Her expectations from physiotherapy were to achieve a range and strength such that she should be able to be independent in her activities of daily living and be able to use her right hand for her routine tasks, especially cooking, washing clothes, and utensils as she was right-hand dominant. The Disabilities of Arm, Shoulder and Hand score[8] was 76% which reveals that she had 76% disability.

The primary goals of her management were pain relief and the ability to perform functional activities. To reduce the pain, we had to release the triggers that developed in the muscle. Instrument-assisted soft-tissue mobilization was used to release her triggers. Her triggers were released thrice a week for 2 weeks and subsequently once a week for 1 week. After every session of instrumental release, she was given cryotherapy to avoid any post-release soreness. Thereafter, she rated her VAS score for activities to be 2/10 and at rest to be 0/10. Her allodynia was also controlled and the skin texture appeared supple and normal. Simultaneously, muscle activation exercises were started to maintain the achieved muscle length post-release.

The first group of muscles targeted for release was biceps as they are necessary to center the head of the humerus. Simultaneously, even extensor carpi radialis longus was released to reduce the shear forces over the radiocarpal joints. Thereafter, the pectorals were released to reduce the anterior shear forces over the humeral head. These three releases itself reduced the pain perception by 50%. Thereafter, the deeper muscles were targeted, which were teres minor and subscapularis which not only reduced the pain further but also improved the shoulder rotation ranges, as shown in Tables 1 and 2.

She was then started with functional activities training of her daily chores. Her shoulder flexion and abduction in multiple planes were trained in the form of wall cleaning exercises. Her hand grips and pinches were trained with clay/dough squeezing, paper clips opening, spike ball squeezing, cutting and cleaning vegetables, and jar opening and closing. Her forearm muscles were trained in pronation and supination by hand to mouth activities, folding of clothes, and page-turning exercises. To train her rotation ranges further beyond 8-week post-operative, wand exercises were started simultaneously with hair combing simulation exercises. The hand behind the back range was trained with cleansing the back with towel ends held in both hands. A strengthening program was also started with theraband and 1 kg dumbell after 8 weeks to add to her individual muscle strength.

We aimed at a more functional training as the patient did not belong to an exercising background. Furthermore, she expected to get back to her household chores; hence, exercises chosen were the ones where she had a sense of being able to contribute to her household activities, initially with breaks or with assistance from the left hand and taking longer but later completely and independently and within a shorter span of time. At the end of 12-week post-operative, she scored 14% on the DASH scale proving that she had a lesser disability in comparison to prior.

DISCUSSION

The main purpose of this case report is to share our clinical experience on the fact that instrumental-assisted soft-tissue mobilization has shown a good result in the release of trigger points and is relatively pain-free way of release, especially

Table 1: Combined movement range pre- and post-physiotherapy

Combined movement	Pre-physiotherapy	Post-physiotherapy
Hand to opposite shoulder	Unable to cross midline	Reached opposite shoulder joint with no compensations
Hand behind head	Unable to perform	Reaches opposite ear with slight retraction at the right scapula
Hand behind back	Shoulder joint was not able to extend	Reaches just above the left posterior superior iliac spine

Table 2: Range of motion of the right shoulder joint pre- and post-physiotherapy

Range	Pre-physiotherapy	Post-physiotherapy
Shoulder flexion	0–20	0–160°
Shoulder abduction	0–25°	0–120°
Shoulder extension	0°	0–30°
Shoulder internal rotation	5–30°	0–60°
Shoulder external rotation	0°	0–40°
Elbow flexion	30–130°	0–130°
Wrist ranges	Full but painful	Full and pain free

in CRPS, wherein the manual release or dry needling would cause the momentary increase in pain and apprehension in the patient. Furthermore, the pressure can be graded and managed based on patient tolerance [6,7]. Moreover, the exercises given were such that she felts involved in her household chores slowly and steadily. Hence, we not only ensured that the patient did her exercises regularly but also we got a non-invasive method of reducing the pain.

Novice techniques, such as graded motor imagery (mirror therapy to be specific) [9] and aquatic therapy [10], are also very useful to treat the allodynia and hyperalgesia associated with the above condition but not very useful for the release of triggers which had developed in her muscles secondary to the immobilization. Hence, we did not use these techniques in her as the control of her upper extremity movements and pain was considerably better with one session of instrument-assisted release itself. With regard to exercises, they were designed to be more functional rather than technique or isolated muscle activation based, as even seen in the study done by Miller *et al*. [11]. This was to ensure that she took part in her activities of daily living and was at the same time able to feel the improvement in active participation progressively which would target her satisfaction quotient positively.

CONCLUSION

Thus, we conclude that a tailor-made patient-specific treatment protocol usually gives really good results, and patient satisfaction must always be the primary goal of the therapist to achieve any positive result.

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