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Case Report

The Role of Diaphragmatic Myofascial Release in Reducing Abdominal Pain in a Patient with Shoulder Pain: A Case-Based Perspective

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Abstract:

Postoperative abdominal and visceral pain is a common complication in patients following appendectomy, especially when associated with peritonitis. The diaphragm, as the primary respiratory muscle innervated by the phrenic nerve (C3–C5), has extensive anatomical and functional relationships with thoracoabdominal and pelvic structures. Fascial restrictions or dysfunction in diaphragmatic movement may contribute to increased intra-abdominal tension and altered visceral mobility, thereby intensifying pain in the abdominal and pelvic regions. This case report presents a 45-year-old female patient who developed persistent abdominal and right thigh pain following an appendectomy complicated by peritonitis. The patient also suffered from right shoulder pain and was referred to physiotherapy for treatment of shoulder pain. In addition to standard physiotherapy, six sessions of diaphragmatic myofascial release were administered.

Outcome's measure was Pain that assessed using the Visual Analog Scale (VAS), chest expansion by tape measure, the Shoulder Pain and Disability Index by SPADI, and the satisfaction by SF-12 quality of life questionnaire. After six sessions treatment consists of diaphragmatic release besides of conventional treatment on shoulder, the patient reported a 90% reduction in visceral pain in the abdominal and inguinal areas. Chest expansion increased from 1.6 cm to 3.5 cm, and the SPADI score improved from 40 to 25. These findings suggest that restoring diaphragmatic mobility through myofascial release can significantly alleviate postoperative abdominal and referred pain, likely by reducing fascial tension and improving neurovisceral dynamics.

Key words: diaphragmatic release; visceral pain; appendectomy; myofascial therapy; abdominal pain

Introduction

Shoulder pain is the third most common musculoskeletal complaint worldwide, with a prevalence reaching up to 67% in some populations [1]. In many cases, this pain is attributed to localized biomechanical dysfunction; however, emerging evidence highlights the role of remote influences, such as visceral and fascial dysfunctions, in contributing to shoulder symptoms. The diaphragm is the primary muscle of respiration, innervated by the phrenic nerve (C3–C5), and shares close neurological and fascial connections with the brachial plexus and muscles of the shoulder girdle. Dysfunction of the diaphragm—whether due to restricted mobility, fascial adhesions, or post-surgical complications—may alter breathing patterns and increase recruitment of accessory respiratory muscles. Several of these muscles directly influence shoulder mechanics, and their overactivation may disrupt the scapulohumeral rhythm and contribute to pain [2,3].

Following abdominal surgery such as appendectomy, patients may develop fascial adhesions, peritoneal irritation, or diaphragmatic restrictions, especially in the presence of complications like peritonitis. Studies indicate that up to 93% of abdominal surgeries result in adhesions, which can provoke chronic or referred pain by altering local and systemic neuromyofascial dynamics [4]. These adhesions and fascial tensions can trigger aberrant afferent input, increased sympathetic tone, and protective postural responses that further reinforce pain cycles [5,6]. In such scenarios, pain is often not limited to the abdominal region but may manifest in more distant structures, including the shoulder.

The myofascial system, rich in mechanoreceptors such as Golgi, Ruffini, and Pacinian corpuscles, plays a crucial role in proprioception and pain perception. Fascial restrictions or scars following surgery can create a state of sustained tension, potentially affecting movement patterns, visceral function, and somatic structures [7]. According to the regional interdependence model, dysfunction in one area—such as the diaphragm—can result in compensatory adaptations and symptoms in distant but functionally connected areas [8]. According to studies, approximately 93% of abdominal surgeries lead to adhesions and chronic or sometimes referred pain.

Sometimes, these adhesions arise from chronic inflammation or infection. Adhesions increase tension and impair deep sensory input in the area, resulting in abnormal output and various consequences such as disturbed protective reflexes, increased autonomic activity, and pain syndromes (Kobesova et al., Valouchova, Lewit) [9]. Various techniques such as massage, myofascial release, and soft tissue mobilization are used to restore the elasticity of the skin near the scar and the underlying soft tissue layers that are affected by the scar and adhesion. Previous studies have shown positive results from soft tissue mobilization in relieving abdominal adhesions and pain, which improve function. For example, abdominal scars may cause pain in the lower back, shoulder, and more distant areas of the body. As a case study, Kobesova and colleagues reported the benefits of manual scar tissue mobilization in a 20-year-old woman with abdominal pain, low back pain, pelvic floor dysfunction, and constipation symptoms [10].

This case report presents the clinical course of a 45-year-old woman who developed chronic right shoulder pain after undergoing an appendectomy complicated by peritonitis. Despite receiving physiotherapy for shoulder pain, her visceral and abdominal pain persisted. A targeted diaphragmatic myofascial release approach was integrated into her rehabilitation plan. The outcomes suggest a meaningful reduction in both visceral and shoulder symptoms, emphasizing the relevance of assessing and addressing diaphragmatic function in patients presenting with complex post-surgical pain syndromes.

Case Presentation

A 45-year-old married woman with one child and employed as an office administrator presented to the outpatient physiotherapy clinic with a primary complaint of chronic right anterior shoulder pain persisting for approximately one year. The pain was localized to the acromial region and lateral aspect of the deltoid, described as dull and activity-dependent. The pain was aggravated by overhead movements and routine work-related tasks.

Clinical Assessment:

Resisted abduction and mid- arc elevation reported with discomfort and pain without significant restriction in active range of motion. During detailed history-taking, the patient revealed undergoing an appendectomy one year prior due to acute appendicitis, which had been complicated by delayed diagnosis, bowel perforation, and generalized peritonitis. Following recovery, she began experiencing persistent discomfort in the abdominal region, particularly in the right lower quadrant, periumbilical zone, suprapubic region, right inguinal area, and anterior thigh. These symptoms coexisted with the onset of right shoulder pain. Based on the chronicity of her symptoms and the distribution of pain—including signs suggestive of visceral-somatic interaction—the treating physiotherapist suspected potential diaphragmatic involvement through fascial continuity, visceral adhesions, or postural compensations following surgery. The therapeutic plan was designed to include both conventional physiotherapy for shoulder pain and diaphragmatic myofascial release to address possible remote contributors.

Intervention

The patient received a total of six treatment sessions over two weeks (three sessions per week, every other day). The treatment protocol consisted of two integrated approaches:

1. Routine Physiotherapy for Shoulder pain consist of Low-frequency TENS (<10 Hz, 200–250 μs pulse duration) applied for 30 minutes around the painful shoulder region and Hot pack applied for 10 minutes prior to exercise. Therapeutic Exercises consist of low-resistance elastic bands exercises for rotator cuff muscles, Internal/external rotation (elbow tucked, 10 reps × 3 sets). Scapular clock (2 minutes), shrugging, protraction, retraction (3 sets of 10 reps each). Stretching: Targeted upper trapezius, levator scapulae, and posterior capsule (30 sec holds × 3 reps).

2. Diaphragmatic Myofascial Release (MFR)

After performing routine physiotherapy interventions, two techniques were used for myofascial diaphragm muscle release. As shown in Figure 1, in the first technique, the patient was in a supine position, the limbs were in a relaxed state, and the therapist stood at the head of the patient. In this position, the therapist's forearms were aligned with the patient's shoulders, and the therapist made contact with the hypochondriac regions using the inner three fingers while positioning them under the costal cartilages of ribs 7 to 10 bilaterally. While synchronizing with the patient's breathing, the therapist applied a gentle upward (elevation) and slightly outward force on the patient's rib cage in coordination with the patient's inhalation, resisting rib motion. This technique was performed in 2 sets of 10 repetitions, with deep breathing and intervals of 1 minute between sets. [13]

Figure 1: first and second method of diaphragm release

In the second technique (Figure 2), the patient lay in the prone position. One of the therapist's hands was placed on the posterior ends of the ribs and the other hand on the patient's abdomen. The therapist then rotated the patient's body slightly from side to side to mobilize the polyaxially region. The therapist repeated this motion in a circular pattern, with each hand moving in opposite directions. Each cycle took one minute per side. This technique was also applied for the diaphragm in the same number of sets. The total duration of the diaphragm release and treatment session for each patient was about 8 minutes. [14]

The combined treatment protocol (routine physiotherapy plus diaphragmatic MFR) was conducted over six sessions on alternate days. Outcome variables measured before and after treatment are reported in Table 1.

Assessments

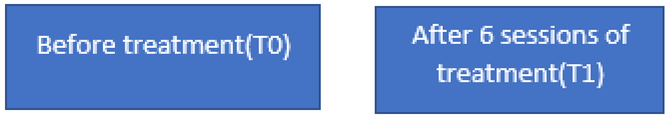

Figure 2: presents the timeline of assessments and interventions in general. The assessments were conducted at baseline (T0), immediately following treatment (T1)

Pain

Pain intensity measured by Visual Analogue Scale (VAS) during daily occupational activities and at rest. The Visual Analogue Scale (VAS) is a widely used, validated tool for assessing the intensity of pain. It typically consists of a horizontal 10-centimeter line, with the endpoints labeled as "no pain" (0) on the left and "worst imaginable pain" (10) on the right. Patients are asked to mark a point on the line that corresponds to the intensity of their perceived pain. The distance from the "no pain" anchor to the patient's mark is measured in centimeters and recorded as their pain score. The VAS is simple, sensitive to changes over time, and useful for both clinical assessment and research purposes.

Chest Expansion Measurement (Circumferential Thoracic Excursion) is a simple and non-invasive clinical method used to assess the mobility of the thoracic cage during respiration. It reflects the function of respiratory muscles—especially the diaphragm—and the compliance of the thoracic wall and lungs. Using a tape measure, chest circumference is measured at a standardized level (commonly at the level of the 4th intercostal space in males or just below the breast in females) during maximal inspiration and expiration. The difference between these two measurements indicates the chest expansion.

The Shoulder Pain and Disability Index (SPADI) is a self-reported questionnaire specifically designed to measure the pain and functional disability associated with shoulder pathology. The SPADI consists of 13 items divided into two subscales: 1. Pain Subscale (5 items): Assesses the intensity of shoulder pain during various activities. 2.Disability Subscale (8 items): Evaluates the degree of difficulty in performing everyday tasks that require shoulder use. Each item is scored on a visual analogue scale (VAS) or a numeric scale from 0 (no pain/difficulty) to 10 (worst imaginable pain/difficulty). The total score is calculated as a percentage, with higher scores indicating greater pain and disability.

The 12-Item Short Form Health Survey (SF-12) is a brief, validated questionnaire used to assess health-related quality of life across both physical and mental domains.

SF-12 is a condensed version of the SF-36 and includes 12 questions that cover 8 health dimensions:

- Physical functioning
- Role limitations due to physical health
- Bodily pain
- General health perceptions
- Vitality (energy/fatigue)
- Social functioning
- Role limitations due to emotional problems
- Mental health

From these, two key composite scores are derived:

- **1. Physical Component Summary (PCS-12)**

Reflects physical health status, including physical functioning and pain.

- **2. Mental Component Summary (MCS-12)**

Reflects mental well-being, including emotional and social functioning.

Both scores are standardized (mean = 50, SD = 10 in the general population), with higher scores indicating better health status. (MCS-12)

Outcome Variable	Before Treatment	After Treatment
VAS during daily work activities	5	4
VAS at rest	3	0
Chest expansion (cm)	1.6	3.5
SPADI score (pain and disability)	40	25
Quality of life – Physical Component (PCS-12)	36.13	53.09
Quality of life – Mental Component (MCS-12)	34.96	39.96

Table 2: Changes in Outcome Variables Before and After Intervention

Results

Following six sessions of combined routine physiotherapy and diaphragmatic myofascial release. Pain intensity decreased during daily activities and completely resolved at rest. Chest expansion improved substantially, disability related to shoulder function reduced, and both physical and mental components of quality of life improved. Importantly, the patient reported approximately a 90% reduction in chronic abdominal pain in the right lower quadrant, umbilical, suprapubic, inguinal, and anterior thigh regions—pain that had persisted since the appendectomy. This reduction remained stable six months after treatment completion. It should be noted that no specific visceral pain assessments were performed prior to treatment as the patient's primary complaint was shoulder pain.

Discussion

In this case, myofascial release of the diaphragm in a patient suffering chronic abdominal pain after appendectomy, alongside shoulder pain, resulted in reduced abdominal and shoulder pain, increased chest expansion, decreased disability, and improved quality of life. The undeniable relationship between the respiratory system and the shoulder joint [14] suggests that the observed improvements may be attributed to the myofascial release of the diaphragm combined with routine physiotherapy. Fascial continuity, neurological connections between the diaphragm and shoulder muscles, and the anatomical-functional relationship between respiratory muscles and shoulder structures may explain the involvement of the shoulder following diaphragmatic dysfunction after abdominal surgery [15]. However, as both routine physiotherapy and diaphragmatic myofascial release were applied simultaneously, it is difficult to isolate the specific contribution of each treatment to the overall improvement.

Nevertheless, increased chest expansion and reduced visceral pain are likely attributable to the release of the diaphragmatic fascia. These findings align with previous studies demonstrating significant improvements in chest wall mobility following diaphragmatic manual therapy. Additionally, the visceral pain relief following manual diaphragm treatment supports the role of fascial release in managing post-surgical adhesions and related symptoms. Since this is a single-case report, further research with larger sample sizes is needed to generalize the effectiveness of these interventions. Given the absence of reported side effects from diaphragmatic myofascial release, and its low cost and non-reliance on special equipment, this technique may be recommended as a complementary approach by other clinicians.

Conclusion

Based on the findings of this case report, diaphragmatic myofascial release appears to be an effective adjunctive treatment for improving shoulder symptoms and chronic abdominal pain following abdominal surgery.

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