RESEARCH ARTICLE

Release of scars improve pain, vertebral mobility and reduce the degree of disability in chronic low back pain

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Abstract

Background: Scars are the inevitable result of injuries, and visceral scar adhesions can generate local and referred pain, through viscerosomatic reflexes. Studies report the existence of relationships between scar adhesions in the abdominal region and low back pain (LBP). **Objective:** to evaluate the immediate and late effect of manual release techniques on abdominal scars on the intensity of LBP, spinal mobility and the degree of lumbar disability in individuals with chronic LBP. **Methods:** 18 volunteers of both genders (15 women and 3 men) with LBP and abdominal scars participated in the study. Pain intensity (VAS), spinal mobility (finger-floor test and lateral inclinations) and degree of lumbar disability (Oswestry questionnaire) were measured. After the assessments, scar release treatment was carried out using manual techniques (gliding, rolling, fascial techniques) for 15 minutes. Immediately after the session, the reassessment (VAS and mobility) was carried out. Two more sessions were carried out with an interval of one week between them and seven days after the 3rd session the final reassessment will be carried out, using the visual analogue scale, oswestry questionnaires and spinal mobility, similarly to the initial assessment. **Results:** The intensity of LBP was significantly reduced after the sessions, remaining lower seven days after the intervention. There was an improvement in spinal mobility, measured by finger-to-floor tests and lateral inclinations after scar release. The volunteers also had a reduction in the degree of lumbar disability after the intervention, demonstrating a reduction in the impact of LBP on carrying out activities of daily living. **Conclusion:** The protocol with 3 sessions of manual scar release proposed presented an immediate and late effect, significantly reducing the intensity of LBP, promoted improvement in spinal mobility and reduced the degree of lumbar disability in the volunteers studied. It is worth noting that these effects remained seven days after completion of treatment.

Keywords: Low back pain; scar; cesarean sections; musculoskeletal manipulations; osteophatic.

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BACKGROUND

Scars are the inevitable result of injuries. The healing process is divided into three continuously and temporally overlapping phases: inflammatory, proliferative, and remodeling[1]. Adhesions caused by surgery can contribute to immediate postoperative pain and also contribute to the development of chronic local or referred pain[2]. Visceral scars are not limited to the skin; they transcend the external incision and are linked to the migration of cells from the visceral tissue. These scars can create adhesions between organs after injuries, infections, or surgeries[3]. Furthermore, due to the high concentration of nerve endings in the visceral fascia, these scars can sensitize the surrounding tissues and trigger viscerosomatic reflexes[4].

There are several techniques for releasing scar tissue, including direct and indirect mobilization of the abdominal viscera[5]. Myofascial release not only has a biomechanical effect that can alter the mobility of soft tissues but can also generate a neurological effect, which causes a reset of the local neurological circuit, stimulation, and a release of nociceptive substances[6]. There is a direct relationship between cesarean scar and lower back pain (LBP). The anatomical relationship between the sacro-recto-genito-vesico-pubic fascia and the scar can give this association[7]. The LBP is a common musculoskeletal disorder, with a high prevalence in the world population, approximately 80%. Although many of these patients recover within a few weeks, 60% to 86% of patients with a first episode of LBP will have a recurrence within a year. And 6% to 10% of patients develop chronic LBP. The cause of the pain may remain unknown in many patients, as it is often diagnosed as nonspecific[8].

Among the various types of physical therapy treatments for chronic LBP, we can mention exercises, massage, ergonomic recommendations, electrotherapy, manipulation, and mobilization. Recently, randomized studies have demonstrated greater efficacy of joint manipulation and joint mobilization in reducing pain[9]. Osteopathic medicine is more than a mechanical approach to disease; it is a system that seeks to eliminate the causes of impaired health and focuses on strengthening the self-healing power that exists within the body itself. It is a therapeutic approach that occurs holistically, seeking the biomechanical balance of the osteomyoarticular system[10]. For Rezende and Gabriel (2008)[11], all structures are interconnected and interact with each other, generating balanced and homeostatic functions. Therefore, it is essential to diagnose and work on the individual globally. Osteopathic treatment is a physical intervention therapy with subtle manipulation techniques as its characteristics. It is less invasive than other interventions and is adapted to the quality of body tissue, maintaining or restoring the circulation of body fluids. It is believed that through a manual system, the body can create its repair instruments through self-healing[12].

Given the above, the objective of the present study was to evaluate the immediate and late effect of three sessions of manual osteopathic techniques on abdominal scars on the pain threshold, spinal mobility, and the degree of lumbar disability of patients with chronic LBP.

METHODS

The institution's Research Ethics Committee approved this study under opinion 17-04/306. All volunteers signed the informed consent form by resolution 466/12 of the National Health Council (CNS). The evaluation and intervention were performed in the afternoon at the Einstein Integrated Colleges in Limeira's physical therapy school clinic. Eighteen volunteers of both genders (15 women and three men) with LBP and abdominal scarring participated in the study. The inclusion criteria were age between 18 and 50 years, scarring in the abdominal region, and LBP for at least three months. The study was conducted with a rigorous approach to participant selection. Pregnant women, individuals who used medication and/or were undergoing treatment for LBP, and those with neurological, metabolic or systemic diseases were carefully excluded from the study, ensuring the integrity of the results.

Each volunteer underwent a comprehensive assessment of the intensity of their LBP using the Visual Analogue Scale (VAS). This thorough approach, which included providing the volunteers with a printed scale and instructing them to mark a point on the line that indicated the intensity of the lumbar pain felt at that moment, ensured the validity of the results.

Then, they answered the Oswestry Lumbar Disability Questionnaire. This scale consists of ten questions with six alternatives ranging from zero to five. The final score ranges from zero (as the absence of disability) to 100 (as maximum disability). After completing the questionnaires, spinal mobility was measured using the finger-to-floor test and lateral tilts. The volunteer remained standing and was instructed to tilt the trunk forward, without flexing the knees, in an attempt to touch the fingers of the hands to the floor. When reaching the maximum amplitude, the researcher measured the distance from the third finger of the dominant hand to the floor with the help of a tape measure. For the lateral tilts, the volunteer was instructed to tilt the trunk to the right without compensation, and the distance from the hand's third finger to the floor was measured. The same procedure was repeated for the left side.

Once the assessments were completed, the treatment sessions were carefully planned and executed. The volunteer remained in the supine position on a stretcher, with knees flexed and feet supported. The area to be treated (abdomen) was exposed, and manual techniques were performed to release the scars present on the abdomen. The maneuvers used were: longitudinal, transverse and circular sliding along the scar, as well as rolling and fascial techniques.

The average duration of the session was 15 minutes, ensuring a consistent and thorough treatment approach. Immediately after the end of the session, the volunteers were reassessed for pain intensity (VAS) and measurements of spinal mobility (finger-to-floor and inclinations). Two more sessions were performed, with a one-week interval between them. Seven days after the end of the 3rd session, all volunteers were reassessed using questionnaires (VAS and Oswestry) and mobility tests (finger-to-floor and inclinations), similar to that described in the initial assessment. Instant software version 3.0 was used for statistical analysis. Initially, the Kolmogorov-Smirnov normality test was performed. As the data presented a normal distribution, the ANOVA test followed by Tukey's posthoc test was used to compare the variables in the different periods. In all analyses, the critical level was set at 5% ($p<0.05$).

RESULTS

Table 1 shows the anthropometric characteristics of the 18 volunteers participating in the study. Regarding the type of scars treated, there were 11 cesarean sections, five appendectomies, one abdominoplasty, and one umbilical hernia. The average duration of LBP was 50.8 ± 32.7 months.

Table 1. Mean values ± standard deviation of the characteristics of the volunteers and treated scars.

n=18	**mean ± dp**
Age (years)	32 ± 11,23
Weight (Kg)	73,2 ± 14,6
Height (m)	1,66 ± 0,06
BMI (Kg/m²)	26,22 ± 4,9
Low back pain duration (months)	50,8 ± 32,7
Cesarean section	n=11
Appendectomy	n=5
Abdominoplasty	n=1
Umbilical hernia	n=1

Note: Kg = kilogram; m = meters; dp = standard deviation.

Regarding the intensity of LBP, Table 2 shows that it was significantly reduced immediately after the intervention (3.9 ± 1.7 cm to 2.1 ± 1.8 cm after the first session; 2.2 ± 2.0 cm to 1.5 ± 1.3 cm after the second session). Seven days after the end of the treatment, the intensity of the pain remained significantly lower (0.9 ± 1.1 cm) than in the pre-intervention period (3.9 ± 1.7 cm).

Table 2. Mean values ± standard deviation of pain intensity, spinal mobility by finger-to-floor and lateral tilt tests and degree of lumbar disability of volunteers before and after the 3 scar release sessions and in the reassessment

	1ª session		**2ª session**		**3ª session**		**Revaluation**
n=18	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**7 days after**
Pain intensity (cm)	3,9 ± 1,7	2,1 ± 1,8*	2,2 ± 2,0	1,5 ± 1,3*	2,5 ± 2,7	1,5 ± 1,5	0,9 ± 1,1#
Finger to floor test (cm)	7,5 ± 14	5,8 ± 12*	7,5 ± 13,5	5,8 ± 12,3	5,7 ± 12,3	4,4 ± 12,3*	2,2 ± 9,8#
Right tilt (cm)	45,3 ± 4,6	42,2 ± 3,9*	41,8 ± 3,8	39,5 ± 3,4*	40,1 ± 6,1	38,9 ± 5,2*	40,4 ± 4,2#
Left tilt (cm)	44,3 ± 3,9	42,4 ± 4,1	42,2 ± 3,9	40,4 ± 3,7*	39,4 ± 5,4	39,2 ± 3,8*	41,0 ± 4,2#
Oswestry	8,4 ± 5,7		7,5 ± 7,3		5,7 ± 5,6*		5,1 ± 6,0*#

Note: cm = centimeters. *$p<0.05$ in relation to the respective pre-intervention period; #$p<0.05$ in relation to the pre-intervention period of the 1st session.

Significant improvements in spinal mobility were observed after the scar release sessions, as evidenced by the finger-to-floor test and the mobility of right and left lateral inclinations (Table 2). This reassurance was further solidified in the reassessment, conducted 7 days after the treatment, where mobility remained significantly higher than in the pre-intervention period for all tests evaluated.

The Oswestry questionnaire score, a key indicator of the degree of lumbar disability, showed a significant reduction in the 3rd session and in the reassessment. The score, which was at 8.5 ± 5.7 pre-intervention, decreased to 5.7 ± 5.6 pre-3rd session and further to 5.1 ± 6.0 in the reassessment. This reduction in the degree of lumbar disability is a testament to the effectiveness of the treatment, encouraging and motivating both patients and practitioners.

DISCUSSION

Visceral scars can trigger repercussions in the somatic system, affecting the skin, muscles and ligaments[13]. Abdominal adhesions are abnormal fibroid bands that attach themselves between the surfaces of organs or the walls of the abdominal cavity. The mechanism underlying adhesion formation involves an initial surgical injury to the peritoneal epithelium, which results in the deposition of fibrin matrix gel between the damaged intra-abdominal surfaces[14].

According to Lewit and Olsÿanska (2004)[15], scars consist mainly of soft tissues and constantly penetrate all their layers. Under normal conditions, soft tissues should move in harmony with the motor system that surrounds them. Scars can interfere with the motor system when these movements are not smooth and offer resistance. Postoperative changes in the deeper layers of the scar do not need to correspond specifically to the site where the surface incision was made. Active scars in the abdomen increase resistance to stretching, thus restricting trunk flexion.

The fascia surrounds all muscles, bones, nerves and each organ, connecting them to each other, forming the fascial system and body continuity. Embryologically, the fascia is derived from the mesoderm, being the continuation of the connective tissue. The fascial system is composed of several layers, each characterized by different directions and thicknesses, communicating and exchanging information[7]. The fascia has a high density of nerve endings that belong to the sympathetic nervous system[16]. The electrical activity of the nervous system transmits not only electrical impulses, but also chemical, neurotrophic and, at the same time, immune substances. Therefore, a patch of skin affected by a scar transmits information to the spinal cord neurons and interneurons, which affects other motor neurons or sensory neurons at the same level[17].

According to Bordoni and Zanier (2013)[17], defective sliding of the fascia, caused by a scar, generates abnormal tension, affecting the continuity of the fascia, causing symptoms such as pain. Changes due to tension may originate from the contractile property of fibroblasts. A non-physiological mechanical environment stimulates an inflammatory environment, with fibroblast hyperplasia, making the fascia denser, developing chronic inflammation and sensitization of nociceptors. The innervation of the fascia is carried out by the sympathetic nervous system, especially in the area close to blood vessels; therefore, the formation of vasospasm and ischemic pain is likely, negatively affecting posture and walking. Connective tissue is more responsive than muscle tissue in activating nociceptors.

Manual therapy uses manual techniques such as joint manipulation, neural mobilization, transverse friction, connective tissue massage, among others, to assess and treat pain caused by restricted range of motion and pain of neuromusculoskeletal origin[18]. Treatment of active scars using gentle, careful manual pressure in the direction in which resistance is felt causes release, restoration of normal mobility, and pain relief, accompanied by reflex changes in other structures of the motor system[19]. This may explain the reduction in pain found in the present study after release of abdominal scars.

According to Heller (2006)[20], part of the effect of the scar is mechanical, altering mobility to some degree. He believes that another effect, probably more significant, is neurological; therapeutic manual force causes a reset of the neurological circuit and releases nociceptive stimulation. Thus, it is believed that the reduction in pain may be due to afferents to the lumbar and sacral regions and also the mechanical relationship of the uterus with the sacrum via the uterosacral ligaments. According to Fernandes and Andrade[21], the uterine innervation consists of parasympathetic nerves from S2 to S4, and sympathetic nerves from T7 to T8, also innervating the upper portion of the vagina and the bladder. The sensory innervation of the uterus, which is responsible for the perception of labor pain, occurs through visceral afferent fibers from the uterine body, located in the spinal cord at the level of T11 and T12. The vagina, perineum and cervix are innervated by nerves that enter the spinal cord at the level of S2 to S4.

The study by Lewitt and Olanskab (2004)[15] evaluated whether an active scar could be relevant to their patient's pain. Fifty-one patients with a mean age of 50 years were observed, with the main complaints being LBP (14), arm and shoulder pain (14), headache (8), cervical pain (3), pain in the thoracic region (3), back pain (4), abdominal pain (2), vertigo (3) and radicular pain (2). They presented scars after appendectomy (18), breast surgery (11), gynecological surgery (4), thoracic surgery (3), extremity surgery (injury) (2), cholecystectomy (2), inguinal hernia (2), laminectomy (2), thyroidectomy (2), orchiectomy (1), hip replacement (1), umbilical fistula (1), rupture of the rectus abdominis muscle (1), pyroborostosis (1), rectal surgery (1) and laser treatment of a duodenal ulcer (1). The techniques used to treat scars included touching the entire area of the scar and its surroundings to relax it, stretching the skin in all directions, and, in some cases, applying heat (a towel soaked in boiling water) and applying pressure in the direction of the pathological barrier. The treatment was performed once, twice, or three times a week for 12 sessions, lasting 4 to 8 weeks, followed by a control examination 2 to 3 weeks later. The scars were considered relevant since 36 of the 51 cases had positive results.

Almeida et al. (2002)[22] evaluated the relationship between chronic pelvic pain and cesarean section. The study was conducted with 199 patients (from January 1998 to January 2000), 116 of whom underwent laparoscopy for the diagnosis of chronic pelvic pain, and 83 asymptomatic patients underwent laparoscopic tubal ligation. A regression analysis was used to assess the association between chronic pelvic pain and a history of previous cesarean section. A history of cesarean section was observed in 67.2% of cases in women with chronic pelvic pain. In asymptomatic women, a history of cesarean section was observed in 38.5%, concluding that there is a strong relationship between chronic pelvic pain and cesarean section.

Comesaña et al. (2017)[23] evaluated the effect of the application of MIT (myofascial induction therapy) on scar thickness, both at a deep and superficial level, as well as the improvement in functional activity and quality of life. Ten women with abdominal scars were evaluated. A radiologist performed ultrasound measurements, and a physical therapist collected all measurement and test data. Ultrasound was performed along the entire scar to assess variations in the depth of fatty tissue, aponeurosis, and muscle tissue compared with healthy adjacent tissue. The Schober test was used as a functional test. The SF-36 questionnaire was used to assess quality of life. After the initial assessment, physiotherapy treatment with MIT was applied in 8 sessions, each lasting 30 minutes, using two deep myofascial induction techniques (longitudinal and transversal -crossed hands and transverse abdominal plane). As a result of this study, a decrease in the size and volume of the scar (measured by ultrasound) was observed, as well as an improvement in trunk mobility and the quality of life of all patients.

A study by Valouchová and Lewitt (2009)[24] assessed the influence of an active abdominal scar on LBP and muscle strength of the abdomen and paravertebral muscles. Twenty-six individuals were selected, 13 of whom had abdominal scars (11 post-appendectomy and two post-cesarean sections), and 13 did not (control group). Active scars were treated with soft tissue techniques (gentle manual pressure was applied in all directions and layers with restrictions and was maintained until the limits were released). Immediately after treatment, a decrease in LBP and improvement in muscle strength were observed. These data corroborate those of the present study, since immediately after the session there was a significant reduction in LBP and improvement in lateral trunk tilt mobility and finger-to-floor test, and at the end of the protocol there was a substantial improvement in the degree of disability of the lumbar spine of the volunteers studied.

CONCLUSION

It can be concluded that the protocol with three sessions of manual scar release proposed presented immediate and late effects, significantly reducing the intensity of LBP, promoting improvement in spinal mobility, and reducing the degree of lumbar disability of the volunteers studied. It is worth noting that these effects remained seven days after the end of the treatment.

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