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MYOFASCIAL PAIN AND TREATMENT: Narrative Review

Myofascial component of cancer pain review

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A B S T R A C T

Background: Pain is a common complaint of cancer patients, experienced by 38%–85% of patients. Some studies have shown a high incidence of myofascial pain syndrome (MPS) in cancer patients.
Aims: 1) To estimate the prevalence of MPS in cancer patients; 2) to examine the efficacy of current treatment options for MPS in cancer patients.
Methods: Narrative review. PubMed, CINAHL, PEDro, and Google Scholar databases were searched from inception until November 2017, for the keywords: cancer; cancer pain; breast cancer; mastectomy; lumpectomy; myofascial pain; trigger points. Trials of any methodological quality were included. All published material with an emphasis on randomized control trials was analyzed.
Results: MPS is prevalent in cancer patients who suffer from pain, with a prevalence of between 11.9% and 44.8% in those diagnosed either with neck or head or breast cancer. Clinical studies showed conflicting results. Four interventional studies found that specific treatment for MPS may reduce the prevalence of active myofascial trigger points and therefore decrease pain level, sensitivity, and improve range of motion (in shoulder) in cancer patients. Two recent randomized control trials showed that pressure release of trigger points provides no additional beneficial effects to a standard physical therapy program for upper limb pain and function after breast cancer surgery.
Conclusions: We recommend including the evaluation of myofascial pain in routine clinical examination of cancer patients suffering from pain. Future studies are needed to investigate the long- and short-term effect of MPS treatments in cancer patients.

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1. Introduction

Pain is one of the most common complaints of cancer patients, experienced by 38%–85% of patients (Portenoy, 2011), and can be expected at any phase of the disease. Studies have shown that up to 33% of cancer patients continue to suffer from pain after curative treatment (Ripamonti et al., 2012), as pain can result from damage or a pathological process in the bone or soft tissue, as well as neuropathy, surgery, chemotherapy, radiation therapy and other, so far unexplained complications (Shaiova, 2006).

Cancer patients often suffer from multifactorial problems, and the source of the pain can be caused by a diverse array of factors. In addition to physical challenges, patients often experience anxiety, depression and other emotional stress during the stages of cancer treatment, which can affect and elevate pain experience (Bates et al., 1993). The evidence indicates that patients who experience unrelieved pain are subject to an increased risk of psychological distress (Syrjala et al., 2014) and other mood disorders (Sheinfeld Gorin et al., 2012), and those patients are at risk of experiencing reduced quality of life (Amichetti and Caffo, 2003; Gulluoglu et al., 2006), including impaired physical functioning.

Pain management most frequently involves the use of pharmacological medicine according to the three-step guidelines of the World Health Organization (Fielding et al., 2013). For many years opioids have remained the most widely used drugs for alleviating cancer pain, though their efficacy has remained in question (Morley-Forster et al., 2003); studies show that between 25.3% and 83% of the patients do not receive full treatment; some still suffer from pain with the risk of it developing into chronic pain in 50% of the patients (Mariotto et al., 2011; Raphael et al., 2010). Recent studies recommend multidisciplinary treatment, which includes the patients and their family taking an active part in addressing the pain, in addition to treatment based on biopsychosocial models, which involve different parts of the medical system.

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In recent years some studies have shown a high incidence of myofascial pain syndrome (MPS) in cancer patients. For example, a study performed at a pain clinic estimated that MPS occurs in up to 90% of cancer patients (Borg-Stein and Iaccarino, 2014). In another prospective cohort study from Singapore (Chua et al., 1999), 15% of 40 head and neck cancer patients treated at a cancer center pain clinic displayed MPS.

MPS is a common form of somatic pain arising from muscles (Gerwin, 2016). Myofascial trigger points (MTrPs) are the main component of this syndrome (Gerwin, 2016; Simons, 2004), defined as hyperirritable spots within a palpable taut band of a skeletal muscle that is painful on compression, stretch, or overload, and that gives rise to a referred pain (Gerwin, 2016). MPS is one of the most common chronic pain conditions, and it is related to back pain, headaches, neck pain, jaw pain (Fricton, 2016), and post-surgical pain.

The aims of this narrative review were: 1) to estimate the prevalence of MPS in cancer patients; 2) to examine the efficacy of current treatment options for MPS in cancer patients.

2. Methods

PubMed, CINAHL, PEDro, and Google Scholar databases were searched from inception until December 2016, for the keywords: cancer; cancer pain; breast cancer; mastectomy; lumpectomy; myofascial pain; trigger points; myofascial release; soft tissue mobilizations, and a combination of these keywords. The titles and abstracts of all studies were reviewed. Criteria for inclusion in the review were the diagnosis of cancer of any type in subjects and evaluation or treatment of myofascial pain syndrome. Trials of any methodological quality were included. All published material with an emphasis on randomized controlled trials (RCTs) was analyzed. Study protocol articles and articles without available full text were excluded from the review. There were no search limitations or language restrictions.

The search results were pooled, and duplicates deleted. The titles and abstracts of all articles were reviewed. Full texts of potentially relevant papers were read and their reference lists searched for additional relevant articles. After excluding all irrelevant papers, a total of 13 publications were included in the review.

We critically analyzed all published material. We are aware that this traditional approach to narrative reviews has much more potential for bias than systematic reviews or meta-analyses; however, we have endeavored to be inclusive and open-minded.

3. Results

3.1. Prevalence of MPS in cancer patients

The prevalence of MPS in the general population is unknown. One classic study specifically looked at the prevalence of MTrPs (muscle tenderness) in the posterior shoulder muscles, evaluating 200 unselected basic airmen (100 males and 100 females) (Sola et al., 1955). They found that about 45% of subjects had hypersensitive areas in these muscles. Referred pain (a necessary sign of MTrP) was found in 12.5%. In another group of 28 asymptomatic individuals who have functioned as controls in clinical studies of MTrPs, 18% had inactive MTrPs in the trapezius muscle, 11% had inactive MTrPs in the anterior scalene, and only 4% had an inactive MTrP in the sternocleidomastoid and in the levator scapula muscle. Active MTrPs reproducing occasional pain occurred in 14% of trapezius muscles, and 11% of levator scapulae muscles, with fewer in the remaining shoulder region and neck muscles (Gerwin, 2001).

Fernandez-Lao et al. (Fernandez-Lao et al., 2010) examined the prevalence of MTrPs in the neck and shoulder muscles of patients suffering from post-mastectomy pain. MTrPs were considered active when digital compression evoked local and referred pain that reproduced pain symptoms that the patient recognized as familiar. MTrPs were considered latent when the local and referred pain elicited by digital compression did not reproduce any familiar pain symptoms in the patient. The mean number of active MTrPs for each woman with post-mastectomy pain was 5.4 ± 1.8, and latent MTrPs $0.4\% \pm 0.6\%$. The healthy control group had only latent MTrPs (0.5 ± 0.6); the age was matched between the groups. Active MTrPs in the pectoralis major ($n = 27$, 93%), infraspinatus ($n = 23$, 79%), and upper trapezius ($n = 19$, 65%) muscles were the most prevalent in the affected side in the post-mastectomy group. Patients with post-mastectomy pain showed a significantly greater total number of MTrPs than the control group.

In a one-year follow-up study (Torres Lacomba et al., 2010) of 116 women with breast cancer, 44.8% were diagnosed with MPS by an expert physical therapist. In these patients, MPS had developed mainly during the six-month period post-surgery, and active MTrPs were found mainly in the latissimus dorsi (25.9%), serratus anterior (24.0%), pectoralis major (20.7%) and infraspinatus (19.0%) muscles. Possible explanations suggested by authors included the positioning of the shoulder during surgery (Hsin et al., 2002), the patient's failure to keep muscles in a shortened position after surgery (Simons, 2004), the surgical scar (Lewit and Olsanska, 2004), excision of pectoralis fascia during surgery, or the biomechanical changes at the upper extremity after surgery. However, the incidence of MPS was not influenced by the type of surgical procedure, by radiotherapy, or by the number of dissected lymph nodes.

A cross-sectional Spanish study (Fernandez-Lao et al., 2012a) assessed the variation in the presence of active MTrPs after two different, but common breast cancer surgeries (mastectomy and lumpectomy) and in women with a diagnosis of breast cancer who had not yet received any surgical treatment but may have received chemotherapy and radiotherapy. The latter group served as the control group. The number of MTrPs within mastectomy and lumpectomy groups was significantly higher, compared to the control group, but there were no significant differences in MTrP prevalence between the two surgery groups. The majority of active MTrPs in the lumpectomy group were found in the pectoralis major (surgical side 46%, non-surgical side 44%), and the infraspinatus (surgical side: 50%, nonsurgical side: 34%) muscles, whereas within the mastectomy group the majority of active MTrPs were found in the pectoralis major (surgical side: 50%, non-surgical side: 44%), and the upper trapezius (surgical side: 57%, non-surgical side: 38%) muscles.

Chua et al. (1999) examined the prevalence, location, severity, type, and causes of pain character and diagnosis of pain felt by 40 patients diagnosed with head and neck cancer. The location of pain was examined using a self-reported body chart, and the pain was classified into three main categories: 1) Somatic nociceptive; 2) Neuropathic pain; 3) MPS. The patients were retrospectively reviewed, and 13% ($N = 6$) were diagnosed with MPS. Out of six patients diagnosed with MPS, only two had received targeted physical therapy for MPS. The authors suggested that the trapezius and sternocleidomastoid muscles may have been affected by the sacrifice of the spinal accessory nerve during radical neck dissection and due to biomechanical changes and disruptions in the muscle and nerve following the surgery.

In a prospective study from Brazil (Cardoso et al., 2015), out of 167 patients treated for head and neck cancer with at least a one-year disease-free interval, 69 patients (57.4%) reported pain, among which 20 (11.9%) were diagnosed with MPS. In the cases where MPS was diagnosed, the upper trapezius muscle was found to be the most commonly affected muscle (80.5% of the cases). Significantly lower quality of life score on the University of

Washington Quality of Life questionnaire was also recorded in these patients.

Ko et al. (2017) performed a retrospective study of 52 breast cancer patients who received surgery and taxane chemotherapy with upper extremity sensory disturbance that began after chemotherapy. In this study 7 (13.5%) patients were diagnosed with MPS and an additional 4 (7.7%) with chemotherapy-induced peripheral neuropathy and MPS. Peripheral neuropathy was more correlated with sensory symptoms at upper and lower extremities, and a shorter time since the chemotherapy commencement. MPS was correlated with a longer duration of taxane chemotherapy and the use of hormone therapy. Authors concluded that when breast cancer patients complain of upper extremity sensory disturbance, various causes, especially referred symptoms from MPS, should be considered for effective treatment.

The aforementioned studies examined patients diagnosed with either head and neck cancer or breast cancer. The demonstrated MPS prevalence varied between 11.9% in a study of patients with head and neck cancer, and 44.8%, in a study of patients with breast cancer. It has been suggested that MPS may develop mainly within a six-month post-surgical period (Torres Lacomba et al., 2010) and is associated with longer duration of taxane chemotherapy and use of hormone therapy (Ko et al., 2017). It has been shown that patients with MPS may overcome the risk of cancer, only to experience a lower quality of life (Cardoso et al., 2015). Overall, active MTrPs have been found in the muscles of the thorax and neck region. In patients with head or neck cancer the pectoralis major, infraspinatus, upper trapezius, and sternocleidomastoid were mostly affected, whereas in patients with breast cancer, the latissimus dorsi, serratus anterior, pectoralis major, infraspinatus and upper trapezius presented with the most problems. Hasuo et al. (2017) found that MTrPs in advanced cancer patients are more commonly observed together with cancer pain rather than independently. Healthcare providers should recognize the relationship between MTrP and cancer pain and proactively perform physical examinations to detect MTrPs for potential treatment.

3.2. Treatment of MPS in cancer patients

The efficiency of myofascial release technique to treat MPS in cancer patients was evaluated in three studies: an RCT (Fernandez-Lao et al., 2012b); a non-controlled prospective clinical study (Shin et al., 2014); and a case series (Hasuo et al., 2016).

The RCT study (Fernandez-Lao et al., 2012b) evaluated the short-term effect of an eight-week multidimensional physical therapy program in 44 breast cancer patients, divided into an intervention and a control group. The intervention group was given a series of 90-min exercises to be repeated three times per week for eight weeks: walking; mobility; stretching exercises with particular attention to neck/shoulder regions; various strengthening exercises; and massage (myofascial release technique). Pain measurements were taken before and after the intervention using a 100-mm visual analog scale (VAS). The intervention group showed a significant decrease in neck pain ($F = 53.032$; $P < 0.001$) and shoulder/axillary pain ($F = 38.175$; $P < 0.001$) compared to the control group after the intervention. Comparing the result in each group before and after intervention demonstrated significant decreases in the number of active MTrPs in the upper trapezius (affected: $P = 0.041$; unaffected: $P = 0.002$); levator scapulae (affected: $P = 0.029$; unaffected: $P = 0.034$); pectoralis major (affected: $P = 0.008$; unaffected: $p = 0.005$); infraspinatus (affected: $p = 0.013$; unaffected: $p = 0.004$) muscles in the intervention group. In contrast, results in the control group showed no significant change in the presence of active MTrPs. Compared to the control group, the intervention group also showed a significant decrease in pressure pain hypersensitivity in C5–C6 zygapophyseal joints ($F = 5.846$; $P = 0.018$), the deltoid muscle ($F = 20.381$; $P < 0.001$), second metacarpal ($F = 40.954$; $P < 0.001$), and the tibialis anterior muscles ($F = 16.237$; $P < 0.001$).

In the non-controlled prospective clinical study (Shin et al., 2014) the authors investigated the effects of ultrasound-guided injection for MTrPs in the internal rotator muscles of the shoulder, in 19 post-mastectomy patients who had at least one active MTrP in the subscapularis and/or the pectoralis major. The procedure was undertaken at one-week intervals; the additional injection was not considered if the patients were satisfied, or if the patient refused another injection. The outcome measures were pain intensity on the VAS during the passive external rotation of the shoulder, and passive range of motion (ROM) of the shoulder for external rotation and abduction. Outcome measurements were assessed immediately after the first injection and three months after the last injection. The subscapularis muscle was affected in all 19 patients and the pectoralis muscle was affected in six of the 19 patients. Patients with active MTrPs in both these muscles simultaneously demonstrated greater pain severity and more limitation in range of motion. The result of this study shows a significant decrease in pain intensity, and improvement in shoulder abduction and external rotation immediately after the first injection and at three months after the last injection ($p < 0.05$ for both); 74% of the patients reported relief of the symptoms after the first injection. Treatment effects decreased as treatment was delayed: initial pain severity was high, and limitation of ROM of the shoulder was severe. Therefore, early intervention is required in order to maximize the treatment effect.

In the case series study (Hasuo et al., 2016), the author evaluated the effect of an intervention on five terminal cancer patients from a palliative medicine center. The intervention included local anesthetic injections, needling, and stretching exercises. The pain level was assessed before and after the intervention using the numeric pain rating scale, and the presence of MTrPs was checked before the intervention. All the patients were diagnosed with MTrPs and reported pain relief after the intervention. Three patients reported complete relief of pain, and two scored 0–3 on the numeric pain rating scale after the intervention. This study has several limitations. The author does not include baseline measurement, information about pre- and post-outcome measures, or an intervention protocol. It is difficult, therefore, to draw any conclusions from this study.

In a retrospective study of 105 advanced cancer patients with a chief complaint of pain who received injection treatment to the MTrPs at the pain site (Hasuo et al., 2017) the MTrPs injection efficacy rate on the day after treatment was 0.59 (95% confidence interval [CI]: 0.50–0.68). Significant factors associated with injection treatment efficacy were: the coexistence of cancer pain with MTrP at the pain site (odds ratio [OR]: 3.87, 95% CI: 1.21–12.4); MTrP in areas other than the lower back or hip (OR: 6.45, 95% CI: 1.98–21.0); fewer MTrPs (OR: 0.64, 95% CI: 0.42–0.99). The injection treatment efficacy is likely high when advanced cancer patients have fewer MTrPs together with cancer pain in areas other than the lower back or hip.

On the other hand, the recent large-scale RCT by the De Groef et al. (De Groef et al., 2017b) found no additional beneficial effects of myofascial technique (pressure release of MTrPs) compared to a standard physical therapy program for upper limb pain after breast cancer surgery. In this study, 147 patients with unilateral axillary clearance for breast cancer received standard physical therapy starting immediately after surgery for 4 months. The intervention group received an additional 8 sessions of myofascial therapy from 2 up to 4 months after surgery. The control group received 8 sessions of a placebo intervention, including static hand placements on the upper body region. At 4-, 9-, and 12-months post-surgery, prevalence rates of pain, pain intensity, and pain quality were comparable between the intervention and control groups.

An additional study by the same group (De Groef et al. 2017a, 2018) of 50 patients with persistent arm pain and myofascial dysfunctions after breast cancer treatment, found that pressure release of MTrPs is an effective modality for decreasing pain intensity in the arm in breast cancer survivors at three months. However, no long-term effects were found at 12 months. Furthermore, no effects were found inactive shoulder ROM; arm lymphedema; upper limb strength; shoulder function (evaluated by Disability of Shoulder, Arm, and Hand questionnaire); and quality of life (Short Form 36).

In both aforementioned studies (De Groef et al. 2017a, 2017b, 2018) the standard physical therapy was very comprehensive. In 30-min sessions patients received (1) passive mobilizations, including angular mobilizations combined with tractions and translations of the shoulder to improve passive and active ROM (10 min on average); (2) stretching and transverse strain of pectoral muscles to improve muscle flexibility; (3) scar tissue massage by gripping scar tissue between thumb and index fingers and moving the hands in opposite direction to improve flexibility of the scar(s) (together with stretching for 10 min on average); (4) exercise to restore and improve muscle flexibility, endurance and strength, posture and movement control and active shoulder ROM. In fact, standard physical therapy included many techniques used to treat MPS (Chaitow, 2010). Therefore, it is possible that the additional effect of the pressure release of MTrPs could not be detected.

The results of the aforementioned studies suggest that non-pharmacological treatment or a combination of non-pharmacological and pharmacological treatment for MTrPs, which may include myofascial release techniques, needling, ultrasound-guided MTrPs injection, and physical activity, may reduce the prevalence of active MTrPs and therefore decrease pain levels, sensitivity, and improve ROM (reviewed studies found ROM improvement in the shoulder, but we believe it can be similar in other joints) in cancer patients.

Treatment options for MPS include stretching; postural and ergonomic modifications (Treaster et al., 2006); strategies to reduce emotional and physical stress (Treaster et al., 2006); massage (Trampas et al., 2010); electrotherapy (Ardic et al., 2002); ultrasound (Farina et al., 2004); dry needling (Kalichman and Vulfsons, 2010); and injections into MTrPs (Kamanli et al., 2005). They are available in many medical centers, but these options are not frequently offered to cancer patients who suffer from pain. In our opinion, both medical practitioners and patients should be informed that treatment focusing on MPS may potentially reduce the level of pain and improve the quality of life and function in cancer patients.

Furthermore, it is well known that patients with underlying malignancy may experience complex pain phenomena (van den Beuken-van Everdingen et al., 2016). The spine accounts for 80% of bone metastatic lesions and is one of the most common sites for the early presentation of metastases (Lote et al., 1986; Nielsen et al., 1991). Cancer of the breast, lung, and prostate are most commonly associated with bony metastases and up to 50% of patients with these types of cancer will develop bone metastases (Nielsen et al., 1991). Therefore, it is important to evaluate and exclude a possibility of regional/systemic metastasis presented as regional pain before any clinical assumption of MPS can be considered. In order to maintain patients' safety, healthcare providers have to be vigilant for metastatic disease before any other possibile cause of pain may be considered in such cases.

4. Conclusions

Current evidence supports the assumption of high MPS prevalence in cancer patients who suffer from pain. Studies have also shown that the diagnosis of MPS in patients correlates with the prevalence of active MTrPs. Currently, only patients with breast and neck and head cancers have been studied, with an 11.9%–44.8% prevalence of MPS. More studies are required to investigate the prevalence of MPS in cancer patients suffering from pain in other areas and with other cancer types. On the basis of these findings, we recommend that the evaluation of myofascial pain should be part of a routine clinical examination of cancer patients suffering from pain.

Four interventional studies (Fernandez-Lao et al., 2012b; Hasuo et al. 2016, 2017; Shin et al., 2014) showed that treatment of MPS may be an effective strategy in cancer patients. However, these studies were of different design, used very different treatment strategies, outcome measures, and study samples. On the other hand, recent RCTs found no additional beneficial effects of the pressure release of MTrPs compared to a standard physical therapy program for upper limb pain and function after breast cancer surgery. Therefore, it is difficult to draw any solid conclusion. Additional high-quality RCTs are needed to investigate the long and short-term effect of MPS treatments in patients with cancer in different areas, and at different stages of the disease.

Conflicts of interest

None.

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