

Physical Therapy Interventions are Beyond Adjunct Care in Improving Quality of Life and Alleviating Pain Related to Cancer and its Treatment: Perspectives and Confronts

Janakiraman Balamurugan^{1*} and Ravichandran Hariharasudhan²

¹Department of Physiotherapy, College of Medicine and Health Sciences, School of Medicine, University of Gondar, Ethiopia

²Department of Physiotherapy, Global Hospitals and Health city, Tamilnadu, Chennai, India

Abstract

Cancer itself and evaluation, treatment procedures are associated with pain and impaired quality of life. Cancer pain relief is one the most difficult task for clinicians due to outsized barriers. Recent evidence suggests that patients with good control of symptoms related to cancer, including pain, helps patients live longer and the quality of life is also bettered at the same time. Analgesic ladder management of WHO is the most accepted and widely used pain management method in patients with cancer pain. But, use of opioids alone is not successful in pain control and improving quality of life. Exercise represents an effective therapeutic intervention for preparing patients to successfully complete treatments, for reducing acute, chronic and late side effects, and for improving QOL during and after treatments. This non systematic narrative review outlines the existing evidences of association between physical exercise, physical therapy intervention strategies, pain control and quality of life, evidence based exercise guidelines for cancer survivors and patients.

Keywords: Physical exercise; Cancer pain; Physical therapy; Quality of life

Introduction

An estimated 7.6 million people from around the world die from cancer each year [1,2] and 3.5 million suffer cancer pain daily [3]. Pain is a major health care problem for patients with cancer and one of the most feared entities [4,5]. Alleviation of cancer pain is also one of the challenging and continuous tasks. Pain, frailty, fatigue, weight loss, and reduced physical function are common among cancer patients with advanced and incurable disease and negatively impact their Quality of Life (QoL) [6-8]. Symptom control and maintaining or improving functions are therefore central goals for the treatment of these patients [6,9].

Estimates of the prevalence of cancer pain widely vary owing to lack of standardized definitions of pain and measuring tool [10]. In general, the prevalence of cancer pain at the time of diagnosis or in early course of disease is estimated to be 50%, increasing up to 75% at advanced stages. The high prevalence of 75% cancer pain is cumulative of categories like pain related to cancer, to its treatment, or to unrelated causes [11]. About 90% of cancer pains are caused by tumour invasion or compression of soft tissues (70%) and procedures related to evaluation or therapies (20%), while the rest is attributed to non-related pain generators [9]. WHO data suggests that 85% of patients are treated by oral morphine alone, others had suggested alteration in route of opioid administration, addition of co-analgesics, anti-neoplastic therapies and neurosurgical modalities [12]. The WHO has published guidelines on the treatment of cancer pain for adults (1990, 1996) and for children (1998). Field testing of these guidelines in adults demonstrated that 70%-90% of cancer pain can be controlled using the WHO Three Step Analgesic Ladder approach [13].

The ladder describes an approach of combining non-opioid, opioid, and adjuvant drugs titrated to meet the individual needs of the patient, according to the severity of pain and its patho-physiology. Despite the well known adverse effects of opioids they are still the most and only recommended therapy for patients with cancer pain [13-16]. Despite substantial advances in non pharmacological or physical therapy pain management and palliative care, the part of supervised and controlled

physical exercise in alleviation of pain in cancer patients was seriously overlooked.

And, the fact is cancer pain still remains grossly undertreated throughout the world [17]. Among 12.7 million new cancer patients about 50% are from low income developing countries, where the resources for cancer pain alleviation are scarce and inadequate pain management is widely prevalent, harmful to patients and costly [18]. A WHO report indicates that 80% of cancer patients have no access to opiates [19]. Other than non availability of morphine several barriers stands as a reason for under treatment.

Common reason for under treatment of cancer pain

1. Poor resources and cost
2. Misconception about cancer pain drugs
3. Lack of standardized pain assessment procedures
4. Physicians opiophobia
5. Frequent surgeries (biopsy, tumour debulking or removal, nerve injuries, thoracotomy)

The overall survival rate for all types of cancer has increased from less than 50% in 1975 to over 68% in 2012 in developed countries. In these countries there is steady increase in number of cancer

***Corresponding author:** Janakiraman Balamurugan, Department of Physiotherapy, College of Medicine and Health Sciences, School of Medicine, University of Gondar, Ethiopia, Tel: +251935468533; E-mail: bala77physio@gmail.com

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survivors with continued improvement in screening and treatment [20]. Epidemiologic studies suggest that the prevalence of cancer is increasing, especially in resource-limited countries and in part related to the aging of the population [21,22].

However, many cancer survivors suffer from acute, chronic and late side effects of treatments and are in a lookout for a better alternative therapy. Physical exercise on the other hand is an effective therapeutic intervention if prescribed properly in managing side effects, pain and improving Quality of Life (QoL) and in particular physical exercise is free of side effect, though risk of adverse effects should be taken care of. A recent study had reported that a vicious cycle is created which might be used to explain the connection of physical inactivity and the worsening of symptoms and side effects [23].

Moreover, physical therapy techniques like relaxations exercises like visual concentration, therapeutic massage via skin stimulations, breathing control, breathing exercises, pendular movement extremities, relaxation positions and slow sustained stretching can help in alleviation of pain by reducing muscle tension, promoting sleep and channelizing energy. Physical therapist definitely hold key role in palliative oncology and therapeutic strategies like ambulation training with or without aids, imagery practice, decongestive physiotherapy, activity modification, strengthening programs, proprioceptive neuro muscular facilitation, endurance training, joint mobilizations, aquatic therapy, work simplification techniques and energy conversation are more than useful in alleviation of cancer pain [24,25].

Types of cancer pain and assessment tools

Many clinicians have designed different classification of cancer pain and some had suggested classification based palliative care. Clinically cancer pain is classified as continuous and intermittent pain. Intermittent pain can be further classified into incident, non-incident and mixed pain. Continuous pain or persistent pain is further divided into incident, non-incident, mixed and end dose pain. One of newer addition in cancer pain is breakthrough pain (BTP) or flare up pain which is a transient escalation of pain superadded to the baseline pain and is prevalent in 40 to 50% patients [26]. BTP named rightly as it breaks through the pain relief provided by drugs and can last for 30 to 45 minutes.

Presence of BTP implies poor QoL and lack of assessment tools makes it harder to quantify [27,28]. Portenoy and others categorized BTP patients into three groups: patients with uncontrolled background pain, patients with controlled background pain but no BTP, and patients with controlled background pain and BTP [29-31]. Pain related to cancer is also classified based on the site of nociceptors like bone (35%), soft tissue (45%) or visceral structures (33%) or neuropathic origin (34%). Regionally, cancer pain is classified as lower back (36%),

abdominal region (27%), thoracic region (23%), lower limbs (21%), head (17%) and pelvic region (15%) (28).

The authors of mechanism based classification of cancer related pain proposed five mechanisms and also mentioned potential physical therapy interventions for those five mechanisms. Scientifically, this mechanism based approach has logic since patients are treated specifically for the component of pain that is involved. The mechanisms are central neurogenic, peripheral neurogenic, peripheral nociceptive, sympathetic maintained or dependent pain and psychosocial mechanisms [32,33].

Assessment of cancer pain should take in account whether the individual is a communicating or non communicating patient. Self reported pain intensity measures like Visual Analogue Scale (VAS), Verbal Rated Scale (VRS), Brief Pain Inventory (BPI) and Numerical Rated Scale (NRS) can be used for patient with intact communication. For patients with communication difficulties tools developed by American Society for Pain Management Nursing like Assessment of Discomfort in Dementia Protocol (ADD), Checklist of Nonverbal Pain Indicators (CNPI), Pain Assessment in Advanced Dementia Scale (PAINAD), Behavioural Pain Scale (BPS) and Critical Care Pain Observation Tool (CPOT) [34,35] can be used. Other assessment tools [36-40] that are generally employed by clinicians in cancer patients to measure QoL and complications of cancer or evaluation and treatment procedures are mentioned in Table 1.

Physical therapy interventions and cancer pain- Applications, association and evidences

Cancer often has catabolic effects on muscles and development of muscle cachexia with subsequent reduction of muscle strength and endurance [41]. Disease modifying and symptom relieving treatments often leads to sedations, fatigue, physical inactivity, loss of mobility, increased dependency in daily activities and hospitalizations, eventually reducing patient autonomy and QoL. Hence, a multi modal approach comprising enhanced physical intervention is needed to decelerate reduction in physical performance and alleviate other problems [42,43].

Mechanism based physical therapy approach

Utility of mechanism based classification for pain in physical therapy interventions are not new though. Studies on treatment of low back pain have utilized a combination of mechanism based approaches and treatment based approaches [25,44]. American Pain Society quality of care task force based on high quality evidences had recommended non pharmacological interventions for treatment of cancer pain [44]. Recent studies had reported potential effectiveness of physical intervention and therapeutic strategies delivered by physical therapist in palliative oncology as ambulation training, passive exercises, respiratory therapy,

| Measuring tool | Characteristics measured |
|---|--------------------------|
| Pain Management Index (PMI) | Under treatment of pain |
| Fatigue Questionnaire (FQ), Functional Assessment of Cancer Therapy–Fatigue (FACT-F) | Fatigue |
| Leeds Assessment of Neuropathic Signs & Symptoms (LANSS) | Neuropathic pain |
| Functional Assessment of Cancer Therapy Head and Neck (FACT-H&N) | QoL |
| Cardio-Pulmonary Exercise Testing (CPET), 6 Min WT | Aerobic fitness |
| Iso-kinetic muscle testing, 1 RM, Grip strength | Muscle strength |
| European Organization for Research and Treatment of Cancer Quality of Life Core Questionnaire (EORTC QLQ) | QoL |
| WHO Fracture Risk Assessment Tool (FRAX) | Secondary osteoporosis |

Note: QoL-Quality of Life, RM-Repetition Maximum, WHO- World Health Organization, WT-Walk test

Table 1: Measuring tools used for assessing specific characteristic in cancer patients.

| PHYSICAL THERAPY INTERVENTIONS FOR CANCER RELATED PAIN | | |
|---|---|--|
| S.no | Physical therapy interventions | |
| | Relaxation massage, Relaxation techniques- Body positioning, Positioning with pillows | Alleviate pain, reduces edema, skin stimulation, reduces anxiety, promotes sleep, and reduces muscle tensions. |
| 2. | Breathing control, Active Cycle of Breathing (ACBT) and Breathing exercises | Alleviates pain, Controls breathlessness, removal of secretion, reduce airway obstruction, enhances thoracic mobility and expansion, improves ventilation-perfusion ratio and reduces fatigue. |
| 3. | Biofeedback | Pain relief, muscle relaxations, controlling blood pressure and heart rate. |
| 4. | Electro-physical modalities-TENS, Heat and Cold | Pain relief |
| 5. | Manual physical therapy- Muscle stretching, manual lymphatic drainage, compression garments, soft tissue mobilizations, passive joint mobilizations, joint distraction, traction, trigger release and high velocity thrust. | Reduce muscle tension, reduces edema, improves range of motion, alleviates pain and improves flexibility |
| 6. | Exercise- Free active exercise, progressive resisted exercise, ambulation training, aerobic exercises, aquatic exercise, Pilate exercise, postural care and re education, balance training, Proprioceptive Neuro muscular Facilitation (PNF) exercises and isometric exercises. | Improves quality of life, reduces fatigue, improves strength, improves endurance, improves pain threshold, reduces incidence of fall, reduces edema, improves posture and alleviates pain. |
| 7. | Activity modification, Imagery or visualization, patient education and behavioural training. | Alleviates pain, reduces fatigue, improves exercise adherence, improves quality of life and reduces depression. |
| Note: All standard precaution and contraindication must be strictly followed during prescription or application of the above interventions. | | |

Table 2: List of Physical therapy interventions for cancer patients.

physical agent rehabilitations, decongestive therapy, education on pain modulations, activity modifications, activity simplifications, relaxation techniques and energy conservations (Table 2) [45]. However, there are also evidences suggesting potential efficacy of electro-physical agents and assistive device in pain control and improving functional independence of cancer patients [45-50].

Evidences of association between physical activity, exercise, and cancer

Physical exercise and increased physical activity are extremely beneficial in patients with cancers, like improved functions, QoL, cardio-pulmonary fitness, strength, pain control, depression and nausea [51]. A previous systematic review reported strong evidences in favour of exercise interventions like aerobic exercise and strength training among cancer patients in improving QoL [52].

A Cochrane review of randomized trials of very low risk of bias on exercise interventions for shoulder dysfunction in patients with head and neck cancer reported that the pooled data of included trails demonstrated that progressive resisted training improves shoulder pain, shoulder disability and active range of motion in comparison with standard care [53,54].

A recent meta-analysis reported that physical exercise had a moderate benefit on reducing cancer related fatigue and improved depression, or sleep disturbance [55].

Treadmill walking and bicycle ergometer training were reported to be significantly effective in improving exercise capacity, muscle function, inflammatory response, dyspnoea and QoL even in patients at advanced stage receiving targeted therapy. The proposed mechanism for improved exercise capacity were reported to be due to physiological changes like increased O₂ pulse, minute ventilation, oxygen extraction and utility and improved oxidative ability of mitochondria. Improved exercise capacity means decreased progressive in turn better pain control, because progressive fatigue is associated with severe pain (51). A meta-analysis found out that exercise interventions of moderate-intensity (3-6 METs, 60%-80% 1-RM) resistance exercise were successful in reducing cancer related fatigue (CRF), regardless of the use of theory in the exercise intervention, age of the cancer survivor, and methodologic intervention quality [56]. Some time exercises were effective when applied in combination with passive techniques like massage in reducing pain and improving mood in even terminal cancer patients.

Exercise-induced improvements in physical function, physical activity level, lean mass, bone mineral density (BMD), and QoL were apparent 6 months after the completion of a resistance exercise program in cancer patients with bone metastases. Graded exercise and regular physical activity as a component of multimodal approach in modulation of cancer pain have a direct influence on the peripheral musculoskeletal system via the exercising muscles [57]. Regular physical activity also bears a direct effect on tissue functions, consequently leading to counter-irritation phenomenon of pain relief. A large population study has identified a strong association between lower level physical activity and higher cancer mortality. Walking or cycling an average of 30 minutes per day has been associated with a 34% lower rate of cancer death and a 33% improved cancer survival. Increasing numbers of studies are indicating that physical activity can reduce the incidence of cancer [58]. World Health Organization recommendations say that undertaking 150 minutes of moderate intensity aerobic physical activity a week can reduce the risk of breast and colon cancers [59,60].

Systematic review of controlled trials of physical activity interventions in cancer survivors, during and after treatment, showed that physical activity had a significant effect. A large effect was shown on upper and lower body strength, and moderate effects on fatigue and breast cancer-specific concerns [61]. Exercise was generally well-tolerated during and after treatment, with minimal adverse events. The study abstracted data from over 82 studies. Mindfulness-based modes of exercise such as yoga and Tai Chi Chuan performed 1-3 times a week for 60-90 minutes at a moderate intensity level can also reduce side effects and improve QoL [62-64].

Guidelines on exercise for cancer survivors

American College of Sports Medicine (ACSM) and Physical Activity Guidelines for Americans (PAGA) advices cancer patients should strive to avoid inactivity, and that any level of physical activity may provide health benefits. PAGA suggests at least 150 min/week of moderate intensity activity and recommends moderate to high activities for major muscle groups at least twice a week, along with stretching and balance exercises. ACSM guidelines further recommend pre evaluation or screening of other conditions such as peripheral neuropathies, musculoskeletal morbidities, and fracture risks. ACSM specify some conditions in which exercise is either relatively or absolutely contra indicated. Those include extreme fatigue or anaemia,

initial wound healing phase after surgery, ostomies, bone metastasis, fever, thrombocytopenia, cardio pulmonary disease and lymphedema [65].

Importantly, contraindication does not mean that a cancer patient or survivor cannot exercise at all; in fact, this is rarely the case. In most instances, contraindications simply require specific modifications to the exercise regimen so that the individual can exercise safely and still achieve physical and mental health benefits.

Conclusion

Cancer pain is very much manageable but still poorly managed. Many studies have proved that different types physical exercise and physical therapy intervention like aerobic exercises, strengthening or progressive resisted exercises, massage, relaxation technique, proprioceptive neuro muscular facilitation, postural exercise and breathing exercise are effective in treating cancer related complications when used in precise dosages, different combinations and clinician should also remember safety issues. Thus, exercise itself is not a single entity but should be combined effectively based on stage of cancer, region, type of cancer, type of drug and several other factors to be effective.

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