



Combination of deep breathing relaxation techniques and aromatherapy to reduce pain in patient with thoracic myeloradiculopathy: a case report

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ABSTRACT

Thoracic myeloradiculopathy is a gradual loss of nerve function caused by spinal cord tumor metastases at the thoracic level resulting in pain and reduced sensation or paralysis. Mrs. N, 59 years old with thoracic myeloradiculopathy, has acute pain as the main nursing problem. The patient has been given pharmacological pain management by administering the analgesic paracetamol 3×500 mg. Acute pain in patients with thoracic myeloradiculopathy can occur in all phases of treatment which causes additional days of treatment so it is necessary to provide complementary therapy which can reduce the days of hospitalization. One of the nonpharmacological complementary therapies that have been proven effective in relieving pain in patients with thoracic myeloradiculopathy is a combination of deep breathing relaxation techniques using aromatherapy. Aromatherapy is given to the patient by dripping an essential oil containing *Lavandula angustifolia* (lavender), *Citrus nobilis* (mandarin orange), and *Origanum majorana* (marjoram) onto cotton and inhaled by the patient. Implementation is carried out once during a 7-day treatment period with a duration of 20-30 minutes after the patient performs personal hygiene or when going to rest. The evaluation results showed that the patient's pain scale decreased significantly from a score of 4 to a score of 2. Giving a combination of deep breathing relaxation techniques and aromatherapy is effective in reducing pain complaints in patients with thoracic myeloradiculopathy in addition to pharmacological therapy given by the medical team).

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1. Introduction

Radiculopathy is a clinical syndrome that causes pathology of the mixed spinal nerve roots containing sensory and motor fibers; whereas myelopathy is a pattern of sensory-motor deficits produced by damage to the spinal cord [1]. Myeloradiculopathy can occur at cervical, thoracic, or lumbosacral levels/areas. Manifestations of myeloradiculopathy pain at the thoracic level are described, such as bandages that can radiate from the posterior chest wall, and the back to the anterior [2].

One of the initial etiologies of thoracic myeloradiculopathy is nerve compression due to spinal tumors, both primary and metastatic [2]. Metastatic tumors, primary tumor cells may metastasize via the venous system, arterial and lymphatic systems, or direct spread. When the epidural venous plexus is valveless, any increase in pressure in the venous cava system can cause backflow into the epidural venous plexus [2].

Spinal cord tumors are generally grouped based on their location, namely: extradural, intradural-extramedullary, and intradural-intramedullary. Spinal cord tumors have characteristic clinical manifestations and can help determine the location of the tumor. If the tumor lesion is in one location, a differential diagnosis can be made for the disease most commonly affecting that site [2]. In this case report, the patient had a tumor of the intradural-extramedullary type with the cause of tumor metastasis. Extramedullary intradural metastases account for 5% of metastatic processes to the spinal cord and are mainly caused by breast and lung cancer, high-grade lymphoma, and decreased metastases from the primary central nervous system (CNS) neoplasms [3]. Extramedullary intradural tumors are tumors that are located within (intra) the dura mater, but outside (extra) the spinal cord [2]. One of the complaints caused by intradural-extramedullary tumors is pain associated with nerve roots in patients with metastatic tumors. This is certainly part of the origin of the tumor. Complaints of pain first appear before other complaints in a matter of weeks or months [4].

Thoracic myeloradiculopathy is a disease that can cause pain in all phases of treatment starting from the preoperative, and surgical phases to the postoperative phase. Complaints of pain in the patient care phase can lead to additional days of treatment [5], so there is a need for complementary therapy as a therapy that can help accelerate pain reduction.

One theory of pain modulation is the Gate Control Theory put forward by Melzack and Wall in 1965. Melzack and Wall proposed that there are nociceptors (pain fibers), and touch fibers synapse in two different areas in the dorsal horn of the spinal cord, namely: cells in the substantia gelatinosa, and "transmission" cells [6]. One of the non-pharmacological complementary therapies for dealing with pain is aromatherapy. The effect of aromatherapy can be explained by the gate control theory which proposes that the perception of pain has a psychological component in which the patient can anticipate pain, and is psychologically stimulated by pain triggers (such as needle insertion, presence of tumor metastases, etc.). The gate is opened by physical (the presence of a tumor), emotional (anxiety and depression), and behavioral factors (focusing on injury and pain). On the other hand, the gate can be closed by using analgesic drugs (physical), feelings of pleasure (emotional), and distraction (behavioral). In particular, aromatherapy can prevent the gate from opening and closing so as to prevent the sensation of pain [7].

Aromatherapy is a technique of utilizing volatile essential oils derived from flowers, herbs, and other plants to enhance spiritual and physical well-being through inhalation which

can reduce pain, psychological stress, and depression, as well as help improve symptoms and vital signs [7]–[10] molecules that come out of essential oils easily combine with oxygen molecules in the surrounding atmosphere when they evaporate. Essential oil molecules are carried by air currents during breathing. Oxygen-rich air mixed with essential oil molecules is inhaled into the nasal cavity until it reaches the olfactory epithelium located at the top of each nasal cavity before being directed down the trachea (windpipe) to the lungs [11]. The aim of this study was to determine the effectiveness of pain management interventions with a combination of deep breathing relaxation techniques and aromatherapy in patients with thoracic myeloradiculopathy.

2. Method

The research sample was a patient (Mrs. N) with thoracic myeloradiculopathy in the internal medicine room Fresia 2 R.S.H.S. Bandung. The data was carried out by analyzed the medical record data, interviews, and observation. The instrument used in this study is the Numeric Pain Rating Scale (NPRS) pain scale.

The method used in this study is a case report. Case reports are familiar ways of sharing events or efforts of intervening with single patients with previously unreported features [12]. In this case, the researcher provides nursing care to a patient with a particular case. The researcher conducted an assessment of the patient and collected some data from medical records. After obtained the data from the assessment results, the researcher analyzed the data and determined several nursing problems. In the next stage, the researcher made an intervention plan and made intervention goals.

Researchers set the diagnosis of acute pain as the main diagnosis and pain management as the main intervention due to the addition of non-pharmacological interventions based on the latest evidence-based practices to increase the effectiveness of the therapy provided.

After collecting the required data, the researcher analyzed the data and determined nursing diagnoses with reference to the Indonesian Nursing Diagnosis Standards [13]. The main nursing diagnosis is acute pain related to physiological agents of injury (thoracic myeloradiculopathy). Pain is characterized by complaints of pain in the back and scapula area which felt since a week ago like rheumatic pain and heat, NPRS: 4 (0 - 10), the patient looked grimacing, blood pressure (BP): 130/80 mmHg, Heart Rate (HR): 90x/minute, temperature: 36.7 °C, Blood oxygen saturation: 97%.

Intervention management is carried out in accordance with the nurse's intervention plan and with the addition of evidence-based interventions by taking into account the patient's autonomic aspects, namely by giving informed consent to the patient and family to be signed as proof of approval and willingness to accept the planned intervention.

The main intervention given to patients is the application of pain management both pharmacologically and non-pharmacologically. Pain management interventions provided include: monitoring vital signs, identification (location, characteristics, frequency, quality, intensity) of pain, as well as facilitating rest and sleep. The patient was given pharmacological therapy of 3 x 500 mg paracetamol at 08.00 am, 16.00 pm, and 20.00 pm, and given gabapentin 2 x 100 mg orally at 08.00 am and 20.00 pm. In addition to pharmacological therapy, patients are also given non-pharmacological complementary therapies such as deep breathing relaxation techniques using aromatherapy.

Aromatherapy is given by dripping 2-3 drops of essential oil containing lavender (*Lavandula angustifolia*), mandarin orange (*Citrus nobilis*), and marjoram (*Origanum*

majorana) onto a cotton area. The patient is asked to inhale the cotton given slowly for 20-30 minutes while doing a deep breathing technique with a count of 4-7-8, namely: inhaling for 4 seconds, holding your breath for 7 seconds, and exhaling for 8 seconds. This combination therapy is given after the patient has done personal hygiene and changed clothes which are intended to reduce complaints of pain, improve the quality and quantity of sleep, and reduce anxiety (anxiety).

3. Results and Discussion

On the first day of treatment, the nurse assessed the pain scale using the NPRS and obtained a score of 4 (0-10) with a moderate pain interpretation. The nurse provided an implementation of pharmacological and non-pharmacological. Non-pharmacological implemented in the form of giving deep breathing relaxation techniques using aromatherapy from day 3 to day 10 treatment. On the 10th day of treatment, the patient's pain scale decreased to 2 (0-10) with a mild pain interpretation. Complaints of feeling hot on the back are still felt by patients occasionally. Evaluation results of pain management with deep breathing relaxation techniques and aromatherapy in Mrs. N. for 10 days of the intervention are presented in Table 1.

Table 1. Comparison results of evaluation of pain management with and without deep breathing relaxation techniques and aromatherapy for 10 days of intervention

Days	Evaluation Time	Intervention	Pain Scale (0-10)	Pain Description	BP (mmHg)	HR (×/minute)	RR (×/minute)	T (°C)
1	08.00 a.m.	Pharmacological therapy as prescribed	4	Pain in the area of the shoulder blades, and back and feels hot, the pain feels intermittent	130/80	90	29	36.7
2	08.00 a.m.	Pharmacological therapy as prescribed	4	Pain in the area of the shoulder blades, and back and feels hot, the pain feels intermittent	130/70	97	26	36.6
3	08.00 a.m.	Pharmacological therapy as prescribed	4	Pain in the area of the shoulder blades, and back and feels hot, the pain feels intermittent	125/62	100	28	36.7
4	12.00 p.m.	Pharmacological therapy as prescribed+ aromatherapy with deep breathing techniques	4	Pain in the area of the shoulder blades, and back and feels hot, the pain feels intermittent	95/62	97	26	36.2

5	12.00 p.m.	when pain arises Pharmacological therapy as prescribed+ aromatherapy with deep breathing techniques	4	Pain in the area of the shoulder blades, and back and feels hot, the pain feels intermittent	87/58	89	22	37
6	12.00 p.m.	when pain arises Pharmacological therapy as prescribed + aromatherapy with deep breathing techniques after personal hygiene and	3	Pain in the right scapula area; feels hot, the pain feels intermittent	98/60	82	20	36.2
7	08.00 a.m.	when pain arises Pharmacological therapy as prescribed + aromatherapy with deep breathing techniques after personal hygiene and	3	Pain in the right scapula area; feels hot, the pain feels intermittent	95/70	98	22	37
8	08.00 a.m.	when pain arises Pharmacological therapy as prescribed + aromatherapy with deep breathing techniques after personal hygiene and	2	Pain in the right scapula area; feels hot, the pain feels intermittent	98/60	97	24	36.5
9	08.00 a.m.	when pain arises Pharmacological therapy as prescribed + aromatherapy with deep	2	Pain in the right scapula area feels hot, the pain feels intermittent	98/70	79	24	36.5

		breathing techniques after personal hygiene and when pain arises						
10	08.00 a.m.	Pharmacological therapy as prescribed + aromatherapy with deep breathing techniques after personal hygiene and when pain arises	2	Pain is felt in the scapula area, feels hot, frequency of pain decreases	90/65	79	22	36.2

Abbreviations: BP, Blood Pressure; HR, Heart Rate; RR, Respiration Rate; T, Temperature

The final evaluation results showed that the pain scale was two on the 10th day of treatment. The pain's duration is erratic and is located in the scapula area. TTV examination showed normal blood pressure, pulse, tachypnoea breathing, and body temperature.

Complaints of pain are intermittent, where there is no definite time to carry out pain management. Providing non-pharmacological pain management with deep breathing relaxation techniques with inhalation of lavender and marjoram aromatherapy can help reduce the patient's pain at any time. Aromatherapy is given to Mrs. N. by dripping 2-3 drops of essential oil containing lavender (*Lavandula angustifolia*), mandarin orange (*Citrus nobilis*), marjoram (*Origanum majorana*) onto the cotton area, and the patient is asked to inhale the cotton slowly for 20-30 minutes while doing deep breathing techniques with a count of 4-7-8 for 20-30 minutes a day. The inhaled essential oil will spread throughout the body and peak in 20 minutes [14], [15]. So, in this case report, the patient performed a combination of aromatherapy and deep breathing relaxation techniques for 20-30 minutes. Breathing exercises performed for 30 minutes a day, 7 days a week for 12 weeks resulted in a significant increase from 27% to 63% pain threshold at various pain points for women with fibromyalgia where the pain is felt, namely in the form of neuropathic pain [16].

In addition to using deep breathing techniques, the researchers also combined aromatherapy using essential oils with three types of ingredients, namely: lavender, mandarin orange, and marjoram. Combining two or three types of essential oil content will be more effective in relieving stress and increasing relaxation than one type of essential oil [17].

Essential oil containing lavender, mandarin orange, and marjoram are proven to be effective in relieving pain, reducing stress and feelings of anxiety, as well as increasing the quantity and quality of sleep. Based on research conducted marjoram aromatherapy is proven to help improve sleep quality in 34 nursing students at Sungshin Women's University, Korea [15].

Lavender aromatherapy has a calming effect and relieves pain which affect sleep quality, and reduce stress in patients with breast cancer [17]. Lavender aromatherapy works by stimulating olfactory receptor cells and transmitting them to the limbic system. Lavender aromatherapy stimulate the olfactory nerves and produce nerve impulses, and have a positive-calming effect [17]. It is supported by another research that stated that lavender aromatherapy effectively relieves pain and reduces anxiety better than almond oil [18]. Each intervention and control group was evaluated using the NPRS. The lavender intervention group (n=17) reported the lowest pain scale level (3.8) compared to the almond oil intervention group (n=15) reported an average pain scale (of 5.6) and the water/control intervention group reported an average pain scale pain (5.6).

Lavender contains two of these compounds, namely: linalool and linalyl acetate, which have been shown to stimulate parasympathetic nerves [18]. In addition, lavender affects serotonin receptors in certain brain areas (hippocampus, anterior cingulate cortex, temporal gyrus, insula) by reducing pain expression and its binding ability in the same way that selective serotonin receptor inhibitor drugs work [18]. In particular, aromatherapy can prevent the gate from opening and closing it so as to prevent the sensation of pain [7].

Essential oil with a combination of mandarin orange (*Citrus reticulata*), Roman chamomile (*Chamaemeleum nobile*) lavender, langon cleri (*Salvia sclarea*), frankincense (*Boswellia carteri*), lavender (*Lavandula augustifolium*) has been shown to significantly reduce labor pain and anxiety [19]. Orange aromatherapy oil is easily available and contains 66-80% limonene. Limonene is the main component in citrus chemical compounds that can inhibit the action of prostaglandins (one of the transmitters of pain) to reduce pain. Another benefit of this aromatherapy is that it normalizes emotional states and provides a calming effect due to the Linalyl acetate content contained in citrus aromatherapy which is an ester compound formed by combining organic acids and alcohol [20]–[22].

Access through the nasal passages is the fastest and most effective way to treat emotional problems such as stress and depression (as well as some types of headaches). This happens because the nose is directly connected to the brain, which triggers the effects of essential oils regardless of the pathway used to reach the brain. The nose can change the temperature and humidity of the inhaled air and collect inhaled foreign matter into the exhaled air. If essential oils are inhaled, the essential molecules in the oil will be carried by turbulent currents up to the roof of the nose. On the roof of the nose, fine hairs (cilia) project from the receptor cells into the nasal passages. Electromagnetic messages (impulses) are transmitted through the olfactory bulbs and olfactory ducts into the limbic system when oil molecules lock these vessels. This process triggers memories and emotional responses via the hypothalamus, which acts as a transmitter and regulator that causes impulses to be sent from other parts of the brain to other parts of the body. The message received will be converted into work to release euphoric, relaxing, sedative or stimulant neurochemicals according to their needs [22]–[25].

4. Conclusion

In this case report it is proven that giving a combination of aromatherapy containing lavender, mandarin orange and marjoram can be an effective complementary therapy to reduce pain in patients. Giving a combination of aromatherapy and deep breathing relaxation techniques can be done independently by the patient so that it is effective when the patient feels sudden pain. This combination of interventions is also effective as a supporting intervention in reducing anxiety and improving sleep patterns.

In its application, the nurse first examines pain, pain scale, and description of pain using the Palliative, Qualitative, Region, Scale, Time (PQRST) approach. In this case, nurses need to provide and teach patients and their families, as well as evaluate the intervention of deep breathing relaxation techniques using lavender and marjoram aromatherapy so that the patient's perceived results are maximized.

This case report has drawbacks, including the limited time for the intervention given so that the progress of the patient's pain cannot be assessed until the end of treatment. In addition, the time of administration of therapy is uncertain/scheduled. Researchers suggest further studies regarding applying a combination of aromatherapy interventions and deep breathing relaxation techniques in patients with thoracic myeloradiculopathy with a larger context and sample so that more comprehensive research benefits and a smaller possibility of bias can be obtained. Research on the timing of giving a combination of aromatherapy and deep breathing relaxation techniques is also needed to determine the right time to give therapy.

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