



Section: Medical Surgical Nursing

Pain management using guided C-arm radiography fluoroscopy in patients with chronic pain

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Abstract

Medical problems commonly reported by individuals in various healthcare settings often involve discomfort or pain. Approximately 20% of the world's population experiences acute pain, and half of them go on to develop chronic pain. Proper treatment for individuals suffering from pain is essential not only to alleviate discomfort but also to enhance their quality of life. Interventional Pain Management (IPM) focuses on minimally invasive techniques guided by imaging tools to treat pain more effectively at its source. IPM utilizing C-arm radiography fluoroscopy is an excellent choice for managing chronic pain. This article presents a case study of Mr. M, who has Herniated Nucleus Pulposus (HNP) and has been complaining of left low back pain for over six months, with worsening symptoms in the last four days. Despite seven days of treatment, his pain did not decrease; in fact, his pain scale increased to 8 (on a scale of 1 to 10) on February 12, 2024. On the eighth day, the patient underwent IPM guided by C-arm fluoroscopy. This intervention significantly reduced his pain scale and contributed to a decrease in his discomfort. While IPM with C-arm guidance does not directly address the underlying cause of HNP, it serves as an effective alternative for alleviating pain by blocking the nerves in the affected area.

Keywords: Pain management; chronic pain; radiography; patient education; hernia care

Introduction

Discomfort, commonly referred to as "pain," is a subjective phenomenon experienced individually by each person, making it unique to the individual and not directly felt by others (Badriyah et al., 2023). Chronic pain, defined as pain lasting more than six months, may arise from known or unknown sources and can often be incurable. As chronic pain persists, the patient's ability to pinpoint its location diminishes, leading to a deeper pain response. The experience of pain is closely linked to the presence of nociceptors—pain receptors located in the skin, mucous membranes, viscera, joints, arterial walls, liver, and gallbladder. These nociceptors, which lack myelin, activate afferent peripheral nerve fibers, allowing pain to be perceived (Bahrudin, 2018). Effective pain management can be achieved through pharmacological interventions, such as analgesics and NSAIDs, which block stimulus transmission to alter perception and response, as well as through non-pharmacological methods (Anggriani et al., 2021). In recent years, Interventional Pain Management (IPM) has emerged as a promising approach to pain management, particularly through the use of C-arm radiography fluoroscopy. This method focuses on minimally invasive techniques guided by advanced imaging tools to accurately detect the source of pain, making diagnosis and treatment more targeted. Despite its potential, health facilities offering IPM services remain scarce, with Soerojo Hospital in Magelang being one of the few providers. Currently, the prevalence of patients receiving IPM with C-arm guidance is approximately one patient every two weeks. Additionally, research discussing the application of IPM with C-arm guidance is limited. This scarcity has prompted the author to analyze the implementation of IPM using C-arm technology in patients suffering from chronic pain, aiming to enhance understanding and improve treatment outcomes in this area.

Herniation of the nucleus pulposus, commonly referred to as a herniated disc, occurs when the soft, gel-like center of an intervertebral disc protrudes through a tear in the tougher exterior (Awadalla et al., 2023). This condition is most prevalent in the lumbar spine, although it can also affect the cervical and thoracic regions (Amin, Andrade, & Neuman, 2017). The nucleus pulposus, which serves as a cushion between the vertebrae, can become displaced due to factors such as age-related degeneration, injury, or repetitive strain. When the nucleus herniates, it may press against nearby spinal nerves, leading to symptoms such as localized back pain, radiating leg pain (sciatica), numbness, tingling, and muscle weakness (Zhang et al., 2023). The severity of these symptoms often depends on the extent of the herniation and the degree of nerve compression. Treatment for herniated nucleus pulposus typically begins with conservative management strategies, including physical therapy, pain medication, and lifestyle modifications (Jordan, Konstantinou, & O'Dowd, 2011). In many cases, symptoms may improve with these non-invasive approaches. However, if conservative treatments fail to provide relief or if neurological deficits worsen, more

invasive options such as interventional pain management techniques or surgical intervention may be considered. Surgical options, such as discectomy or spinal fusion, aim to relieve pressure on the affected nerves and stabilize the spine.

Herniation of the nucleus pulposus is a significant source of pain that affects many individuals, particularly those in middle age. This condition occurs when the soft, gel-like center of an intervertebral disc—the nucleus pulposus—protrudes through a tear in the tougher outer layer, often leading to compression of nearby spinal nerves. The resulting pain can be debilitating, manifesting as localized discomfort in the back, radiating pain down the legs (sciatica), numbness, tingling sensations, and muscle weakness (Abdullah et al., 2021). The severity of these symptoms varies depending on the degree of herniation and the extent of nerve involvement. Factors contributing to this condition include age-related disc degeneration, trauma, repetitive stress, and lifestyle choices such as poor posture or lack of physical activity. Effective pain management for individuals with a herniated nucleus pulposus typically begins with conservative treatments, including physical therapy, anti-inflammatory medications, and lifestyle modifications aimed at reducing strain on the spine (Yang et al., 2015). However, if these approaches fail to alleviate symptoms or if neurological deficits become pronounced, more invasive interventions, such as interventional pain management techniques or surgical options like discectomy, may be necessary to relieve pressure on the affected nerves and restore function. For this reason, the study aims to evaluate the effectiveness of pain management in reducing pain in patients with herniated discs.

Case Description

The patient is a 52-year-old man who weighs 69 kg and is 170 cm tall. He reported experiencing left lower back pain for more than six months, with a significant worsening occurring four days prior to his hospital admission. The pain became so severe that he fainted while walking due to the intensity of the discomfort. The patient has a history of a waist sprain from lifting heavy objects. Upon examination, his blood pressure was 145/98 mmHg, pulse rate was 120 beats per minute, temperature was 36.5°C, and respiration rate was 20 breaths per minute. Laboratory tests showed hemoglobin at 18.1 g/dl, hematocrit at 52%, leukocytes at 9.3 thousand/ μ l, erythrocytes at 6.01 million/ μ l, and platelets at 257 thousand/ μ l. The patient described the left waist pain as sharp, akin to being stabbed, and noted that it appeared suddenly but did not last long. The pain was provoked by movement and was rated as a 6 on a scale of 1 to 10. He also experienced insomnia, characterized by facial grimacing due to pain. Supporting examinations, including lumbar-sacral X-rays, indicated spondylosis lumbales with suspected signs of herniated nucleus pulposus (HNP) at the L4-5 level, canal stenosis, and mild axial compression at the same level, accompanied by chronic discitis. The conclusion of the examination was unstable lumbo-sacral, leading to a medical diagnosis of lumbar nucleus pulposus hernia (HNP). The nursing diagnosis identified for the patient was chronic pain associated with physiological injury agents. The nursing plan included pain management interventions aimed at reducing the patient's pain, with outcome criteria such as the patient not grimacing in pain, displaying a relaxed facial expression, and reducing the pain scale to zero. Interventions included a comprehensive pain assessment focusing on location, duration, frequency, characteristics, quality, and precipitating factors. The nursing staff assisted the patient in finding a comfortable position, taught deep breathing techniques, and encouraged family members to provide warm compresses as needed. Additionally, collaboration was established for analgesic administration.

On February 9, 2024, at 10:18 PM, the patient complained of worsening pain, rating it as a 7 on a scale of 1 to 10. An analgesic injection of ketorolac 50 mg was administered with a NaCl drip of 100 cc over 8 hours. On February 10, 2024, at 1:00 AM, the patient still reported pain, prompting the application of a warm compress to the left waist. By February 11, 2024, the patient's pain scale had decreased to 5, and in collaboration with a physiotherapist, the patient was scheduled for range of motion (ROM) and core exercises. However, on February 12, 2024, the patient reported an increase in pain to a scale of 8. Collaboration with the Pain Management Team resulted in scheduling interventional pain management with C-arm guidance for February 16, 2024, at 9:00 AM. After the interventional procedure on the same day, the patient was discharged at 4:00 PM, with a follow-up appointment scheduled at the pain clinic for seven days post-discharge, specifically on Wednesday, February 21, 2024.

Discussion

Based on the results of the supporting examination of lumbar-sacral X-rays, the findings indicated spondylosis lumbalis with suspected signs of herniated nucleus pulposus (HNP) at the L4-5 level, canal stenosis (+), and mild axial compression at L4-5, accompanied by chronic discitis at the same level. The medical diagnosis made by the attending physician was that the patient had HNP, a condition that can cause significant pain in the vertebrae. HNP occurs when the nucleus pulposus, a gel-like substance within the disc, protrudes out of the spinal joint (Schoenfeld & Weiner, 2010). A lumbar nucleus pulposus herniation is characterized by localized displacement of the disc beyond the anatomical limits of the intervertebral space, leading to pain, weakness, numbness, and/or tingling in a myotomal or dermatomal distribution (Awadalla et al., 2023). Lumbar nucleus pulposus herniation can result in substantial radicular symptoms, which, if persistent, may require surgical intervention. Patients often complain of pain in the sacroiliac region that radiates to the buttocks, thighs, and calves, commonly referred to as sciatica. Other symptoms

may include a stiff or unnatural posture of the spine, along with a combination of paresthesias, weakness, and impaired reflexes. Radiological readings revealed spondylosis lumbalis, indicating degeneration of the spine. The earliest change in spondylosis is disc desiccation. Repetitive motion can erode the cushioning of the vertebral bodies, disrupting the blood supply to the center of the intervertebral disc, which consists of the nucleus pulposus and annulus fibrosus, resulting in HNP (Yaman et al., 2024). Additionally, a positive canal stenosis indicates narrowing of the spinal canal or intervertebral foramen in the lumbar region, leading to compression of the nerve roots exiting the foramen (El Melhat et al., 2024). The primary clinical manifestation in patients with HNP is often radiculopathy, characterized by pain radiating to the extremities. Sensory disturbances may include pain radiating to the extremities, tingling sensations, hypoesthesia or anaesthesia, and impaired coordination. Motor impairments can manifest as decreased or lost reflexes and muscle weakness in the extremities.

Based on the assessment data, the author formulated the nursing diagnosis as follows: Chronic Pain (D.0078) associated with physiological injury agents, as evidenced by the patient reporting left lower back pain that worsens with movement, describing the pain as sharp, with a pain scale rating of 6 (moderate pain), difficulty sleeping, a grimacing facial expression during pain episodes, and vital signs showing blood pressure of 145/98 mmHg, pulse of 120 bpm, temperature of 36.5°C, and respiration rate of 20 breaths per minute. Given an intervention for 3x24 hours, it is expected that the pain level (L.08065) will decrease, with criteria including reduced pain complaints, decreased grimacing, and improved sleep quality. Interventions provided for pain management (I.08238) included observation and identification of pain scale, location, characteristics, duration, frequency, quality, and intensity. Therapeutic measures involved teaching deep breathing relaxation techniques and applying warm compresses. Collaborative actions with physiotherapists included range of motion (ROM) exercises and core exercises, along with interventional pain management using C-arm guidance. Despite these efforts, the patient's pain complaints did not decrease over the 7-day treatment period. On February 12, 2024, the patient's pain scale increased to 8 (scale 1-10). Consequently, the attending physician collaborated with the Hospital Pain Team to schedule interventional pain management with C-arm guidance for February 16, 2024, at 9:00 AM. By the afternoon of the same day, the patient was discharged after showing a decrease in the pain scale to 4 (scale 1-10), a relaxed facial expression, and vital signs within normal limits: blood pressure of 118/80 mmHg, pulse of 98 bpm, temperature of 36.4°C, and respiration rate of 20 breaths per minute. A follow-up appointment was scheduled at the Pain Clinic for 7 days post-hospitalization.

During the 7-day treatment, the patient's pain scale fluctuated. On February 9, 2024, the patient received Myores 2 mg orally and was taught deep breathing relaxation techniques. Myores contains tizanidine, a muscle relaxant that works by inhibiting nerve impulses, allowing muscles to relax (Kaddar et al., 2012). Teaching deep breathing relaxation techniques to patients with low back pain can enhance nurses' knowledge and ability to perform independent activities aimed at relieving pain (Aritongang, 2023). On February 10, 2024, the patient experienced an increase in pain to a scale of 7 and subsequently received a ketorolac injection of 50 mg in a 100 cc NaCl drip. Ketorolac is effective for relieving mild to moderate pain, commonly used for conditions such as toothaches, menstrual pain, sprains, postoperative pain, and acute joint pain (Vacha, Huang, & Mando-Vandrick, 2015). From February 12 to February 15, 2024, the patient continued to receive ketorolac injections of 50 mg in NaCl 100 cc every 8 hours, along with collaboration with a physiotherapist for ROM and core exercises. The ROM exercises included the William Flexion Exercise, which comprised six movements such as Pelvic Tilt, Knee to Chest, Hip Rolling, Pelvic Lift, Lower Abdominal Exercise, and Hip Extension. These exercises were performed with the physiotherapist's assistance over a 20-minute session (Matheve, De Baets, Bogaerts, & Timmermans, 2019). Core exercises aimed to improve the function of trunk muscles, enhancing inter-segmental movement control of the spine and facilitating postural control and coordination of the spine and pelvis through motor learning principles. After three days of ROM and core training, the patient's pain scale increased from an initial rating of 5 to 8.

Throughout the 7-day hospitalization, the patient did not show a significant decrease in pain scale, prolonging the average length of stay. On the seventh day of care, the patient was scheduled for interventional pain management with C-arm guidance. This intervention successfully reduced the patient's pain scale from 6 to 4 (scale 1-10). The patient underwent radiofrequency ablation (RFA), a procedure using radiofrequency waves to deactivate or calm nerve tissue that transmits pain signals, thereby reducing pain signals from the source. These radiofrequency waves are generated by a specialized device and delivered through a needle directed toward the nerve responsible for the pain, guided by C-arm imaging. RFA is a minimally invasive procedure that has been utilized for over three decades to treat various chronic pain syndromes, including trigeminal neuralgia, post-herpetic neuralgia, low back pain, and complex regional pain syndrome or reflex sympathetic dystrophy. Although interventional pain management with C-arm guidance does not address the underlying cause of HNP, it serves as an alternative method to alleviate pain by blocking pain signals in the affected area. This article discusses a single patient case regarding the effectiveness of interventional pain management with C-arm guidance, highlighting a decrease in the patient's pain scale post-procedure without the need for additional analgesic therapy. Based on observations of multiple patients who received interventional pain management with C-arm guidance at Soerojo Hospital, a series of actions were implemented to effectively reduce or eliminate pain complaints. This nursing final scientific work can serve as a reference for future research aimed at identifying effective pain management strategies for patients with HNP.

Conclusion

The study demonstrated that this approach can effectively reduce anxiety in patients, leading to lower blood sugar levels. This therapy can be particularly beneficial for patients experiencing anxiety, helping them feel more relaxed and better able to accept their chronic condition, such as diabetes mellitus. Additionally, hypnotherapy serves as a valuable non-pharmacological treatment option for individuals with diabetes. Patients are encouraged to utilize hypnotherapy as a therapeutic method to manage anxiety, enabling them to live more peacefully without being overwhelmed by fear or stress. For nurses, it is essential to conduct thorough assessments, accurately determine diagnoses, and incorporate hypnotherapy techniques as part of nursing interventions. Ensuring the effectiveness of these techniques can significantly help in managing patient anxiety. Hospitals are encouraged to consider hypnotherapy as a reference for health workers, enabling them to implement this therapy and enhance the overall health outcomes for their patients.

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