

Implementation of Slow Deep Breathing After Implant Removal Surgery: A Case Study

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Article Info:

Submitted:

02-06-2026

Revised:

10-06-2026

Accepted:

18-06-2026

DOI:<https://doi.org/10.3126/>



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ABSTRACT

Introduction: Postoperative pain is a common problem following implant removal surgery and may interfere with recovery. Uncontrolled pain can increase blood pressure, pulse rate, and decrease patient comfort. Slow deep breathing is a non-pharmacological intervention that promotes relaxation and helps reduce pain perception

Method: A descriptive case study was conducted on one day-0 postoperative implant removal patient experiencing moderate pain. Slow deep breathing was administered twice daily for three days, with each session lasting 15 minutes. Pain intensity was measured using the Numeric Rating Scale (NRS).

Result: Pain intensity decreased from NRS 6 (moderate pain) on the first day to NRS 2 (mild pain) on the third day

Conclusion: Slow deep breathing helped reduce postoperative pain intensity, as evidenced by a decrease in pain score from NRS 6 (moderate pain) to NRS 2 (mild pain) after three days of intervention. This technique may be used as a simple, safe, and complementary nursing intervention for postoperative pain management.

Keywords: acute pain, implant removal, fibular fracture, postoperative pain, slow deep breathing

Introduction

Pain is one of the most common complaints experienced by patients following surgical procedures, including implant removal surgery. Postoperative pain occurs as a result of tissue trauma caused by surgical incisions and tissue manipulation during the procedure (Syahfitri, 2021). Tissue injury triggers the release of inflammatory mediators, including prostaglandins, histamine, bradykinin, and substance P, which increase nociceptor sensitivity and generate pain sensations (Andarmoyo, 2019; Nadianti, 2023). If not managed adequately, postoperative pain may activate the sympathetic nervous system, leading to increased blood pressure, heart rate, respiratory rate, oxygen consumption, anxiety, impaired mobility, delayed recovery, and reduced quality of life (Potter, 2021; Puspitasari, 2023)

Fracture management commonly involves Open Reduction Internal Fixation (ORIF), a surgical procedure that uses plates and screws to maintain bone alignment during healing

(Dobbe et al., 2020). Following fracture union, implant removal may be indicated to relieve discomfort, prevent implant-related complications, or restore function (Haseeb & Butt, 2017; Yuan et al., 2022). Although implant removal is generally considered a safe procedure, patients remain at risk of experiencing acute postoperative pain due to tissue trauma associated with surgery. Madhukar (2025) reported that 12.9% of patients experienced pain or discomfort following orthopedic implant removal procedures.

Pain management can be achieved through both pharmacological and non-pharmacological approaches. One non-pharmacological intervention frequently used in nursing practice is slow deep breathing (SDB). Slow deep breathing is a relaxation technique performed through controlled slow inhalation and exhalation to induce relaxation, improve oxygenation, reduce sympathetic nervous system activity, and stimulate the release of endorphins and enkephalins as natural analgesics, thereby reducing pain perception (Multazam, 2023).

Previous studies have demonstrated the effectiveness of slow deep breathing in reducing pain intensity among postoperative patients. Wiyono et al. (2022) reported that deep breathing relaxation effectively reduced pain intensity in patients following ORIF surgery. Similarly, found that slow deep breathing significantly decreased pain intensity among postoperative lower-extremity fracture patients (Ismiati, 2024). A systematic review and meta-analysis Joseph et al. (2022) further indicated that slow deep breathing was associated with reductions in acute pain intensity across several clinical settings.

Despite the growing evidence supporting slow deep breathing for postoperative pain management, studies specifically describing its implementation in day-0 postoperative implant removal patients remain limited. Furthermore, preliminary observations in the Seruni Ward of Dr. Soebandi General Hospital Jember revealed that postoperative pain management primarily relies on pharmacological analgesics, while slow deep breathing has not yet become a routine nursing intervention.

The first 72 hours after surgery represent a critical period for acute pain management because inflammatory responses are at their peak during this phase. Effective pain control during this period is essential to prevent adverse physiological and psychological consequences and to support optimal recovery (Timerga et al., 2024). Therefore, this study aimed to describe the implementation of slow deep breathing in reducing pain intensity in

a day-0 postoperative implant removal patient following fibular fracture union after ORIF in the Seruni Ward of RSD dr. Soebandi Jember.

Method

Design

This study employed a descriptive case study design. The case study approach was used to describe the implementation of slow deep breathing as a nursing intervention for reducing pain intensity in a postoperative implant removal patient. The study focused on the nursing care process and changes in pain intensity following the intervention.

Setting and Time

The study was conducted in the Seruni Ward of RSD dr. Soebandi Jember, Indonesia. Data collection and intervention implementation were carried out from June 2 to June 4, 2026.

Population, Sample, and Sampling

The target population consisted of postoperative orthopedic patients experiencing acute pain. The study subject was selected using purposive sampling based on predetermined inclusion criteria. The participant was a day-0 postoperative implant removal patient following fibular fracture union after ORIF who experienced acute pain and was willing to participate in the study. Therefore, the sample consisted of one patient.

Intervention (if applicable)

The intervention used in this case study was slow deep breathing (SDB) as a non-pharmacological nursing intervention to reduce postoperative pain in a patient following implant removal surgery. The theoretical basis of this intervention is that slow and deep breathing stimulates the parasympathetic nervous system, promotes relaxation, decreases muscle tension, and modulates pain perception through improved oxygenation and reduced sympathetic activity.

The intervention consisted of guided slow inhalation through the nose followed by slow exhalation through the mouth. The patient was instructed to inhale deeply for approximately 4 seconds, hold the breath for 4 seconds, and exhale slowly for approximately 4 seconds. This breathing cycle was repeated continuously for 10–15 minutes in each session (Rosyida & Purwanti, 2024).

The intervention was administered twice daily, in the morning and afternoon, for three consecutive postoperative days (Day 0, Day 1, and Day 2). Pain intensity was assessed using the Numeric Rating Scale (NRS) before and after each intervention session.

As this study employed a single-case study design, no comparison or control group was included. The effectiveness of the intervention was evaluated by comparing the patient's pain intensity before and after each implementation session throughout the observation period.

Instrument and Measurement Properties

The primary instrument used in this study was the Numeric Rating Scale (NRS), which measures pain intensity on a scale ranging from 0 (no pain) to 10 (worst possible pain). Observation sheets and nursing documentation records were also used to record patient responses during the intervention period.

Data Collection Procedure

Data were collected through nursing assessment, direct observation, physical examination, patient interviews, and review of medical records. Pain intensity was assessed before and after each slow deep breathing session. The intervention was administered twice daily for three consecutive days, with each session lasting approximately 15 minutes.

Data Analysis

Data were analyzed descriptively by comparing pain intensity scores before and after the implementation of slow deep breathing. The findings were presented narratively and in tabular form to illustrate changes in pain intensity throughout the intervention period.

Ethical Declaration

Before data collection, the patient received an explanation regarding the study objectives, procedures, benefits, and duration of the intervention. The patient voluntarily agreed to participate and provided informed consent. Confidentiality and anonymity were maintained by using initials instead of the patient's full identity in all research records and reports.

Result

Measurement of pain intensity in the postoperative implant removal patient was performed using the Numeric Rating Scale (NRS), a pain assessment instrument that measures pain severity on a scale of 0–10, where 0 indicates no pain and 10 indicates the worst possible pain. The NRS was used to assess pain intensity before and after the implementation of slow deep breathing during the intervention period.

Table 1. Numeric Rating Scale (NRS) Scores During the Intervention Period

Day	SCORE SKALA NRS (<i>Numeric Rating Scale</i>)				Note
	Implementation				
	Morning		Afternoon		
	PRE	POST	PRE	POST	
Day 0			6	6	Moderate Pain
Day 1	5	4	5	3	Moderate Pain
Day 2	4	3	3	2	Mild Pain

As shown in Table 1, pain intensity gradually decreased throughout the intervention period. The pain score decreased from 6 on postoperative day 0 to 2 on day 2 following repeated slow deep breathing sessions.

Discussion

Pain Intensity Before the Implementation of Slow Deep Breathing

The assessment results showed that the patient experienced moderate pain with an initial Numeric Rating Scale (NRS) score of 6 on postoperative day 0 following implant removal surgery. This finding is consistent with the theory that postoperative pain commonly occurs due to tissue trauma caused by surgical incisions and manipulation during surgery. Tissue injury stimulates the release of inflammatory mediators such as prostaglandins, bradykinin, histamine, and substance P, which activate nociceptors and increase pain perception (Muhtadini & Permana, 2024).

In this case, the patient reported pain at the surgical site, especially during movement. The pain was described as intermittent and was accompanied by limited mobility due to discomfort. These findings are in line with previous studies indicating that acute postoperative pain is generally most prominent during the first 24–72 hours after surgery because the inflammatory response reaches its peak during this period. Inadequately controlled pain may interfere with physical activity, delay recovery, and reduce patient

comfort. Patients may also develop avoidance behaviors by limiting movement and daily activities due to fear of pain, which can further impair the recovery process (Hakam, 2023).

Therefore, appropriate pain management is necessary during the early postoperative period. In addition to pharmacological therapy, non-pharmacological interventions may be applied as complementary approaches to improve pain control and promote patient relaxation.

Pain Intensity After the Implementation of Slow Deep Breathing

The results demonstrated a gradual decrease in pain intensity following the implementation of slow deep breathing. The patient's pain score decreased from 6 on postoperative day 0 to 2 on day 2 after repeated intervention sessions. This finding suggests that slow deep breathing contributed to reducing pain intensity during the postoperative recovery period.

In addition, slow deep breathing provides a positive physiological effect by promoting relaxation and enhancing the patient's sense of comfort during recovery (Kushariyadi, 2019). The activation of the parasympathetic system promotes muscle relaxation, reduces sympathetic responses, improves oxygen delivery to tissues, and stimulates the release of endogenous opioids such as endorphins and enkephalins. These physiological mechanisms may inhibit pain transmission and decrease the patient's perception of pain (Prabawa, 2022).

The findings of this study are consistent with previous research reporting that slow deep breathing effectively reduces postoperative pain intensity among surgical patients (Sadriati & Yuliana, 2025). Repeated breathing exercises may enhance relaxation and help patients divert their attention away from pain sensations (Smeltzer & Bare, 2020). In addition, the intervention is simple, safe, inexpensive, and easy to perform independently, making it a practical complementary nursing intervention for postoperative pain management.

Although pain reduction was observed, the patient also received pharmacological analgesic therapy during hospitalization. Therefore, the decrease in pain intensity may have resulted from the combined effects of pharmacological treatment and slow deep breathing. Nevertheless, the findings indicate that slow deep breathing can support pain management and improve patient comfort during the postoperative period.

Conclusion

The implementation of slow deep breathing was associated with a reduction in pain intensity in a postoperative implant removal patient following fibular fracture union after ORIF. Pain intensity gradually decreased from moderate pain (NRS 6) to mild pain (NRS 2) during the three-day intervention period. These findings indicate that slow deep breathing may be used as a simple, safe, and complementary nursing intervention to support postoperative pain management and enhance patient comfort during recovery.

Acknowledgement

The authors would like to express their sincere gratitude to the patient who willingly participated in this case study. The authors also extend their appreciation to the nursing staff and healthcare professionals at the study hospital for their valuable assistance during data collection and implementation of the intervention. Special thanks are addressed to the academic supervisors for their guidance and constructive feedback throughout the completion of this manuscript.

Conflict of Interest

None

Funding Sources

None

Author Contributions

NNS conceptualized the study, collected the data, implemented the intervention, analyzed the findings, and drafted the manuscript. MH supervised the study, provided methodological guidance, critically reviewed the manuscript, and approved the final version. K critically reviewed the study design and manuscript, provided scientific recommendations, and approved the final version of the manuscript. S critically reviewed the clinical aspects of the study, provided professional recommendations, and approved the final version of the manuscript. All authors have read and approved the final manuscript.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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