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Systematic Review

"Beyond The Operating Room: Physiotherapy Techniques for Abdominal Surgery Rehabilitation"

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Abstract:
Laparotomy is now an integral component of the modern surgical practice from simple elective appendicitis to complex oncological operations. However, with the years, the operative risks have been minimized by the advancement in surgical procedures, but the postoperative period is crucial for the patient's healing and subsequent physiotherapy. This phase includes concerns like pain management, complications related to immobility, and the use of multiple approaches to improve the patient's outcome. Today, physiotherapy is considered one of the critical steps in the postoperative care of patients who have undergone abdominal surgery. They are the promotion of early mobility to avoid complications such as muscle atrophy and thromboembolism, pain management that does not involve the use of opioids, and physical therapy to enable patients to regain their mobility and hence have a better quality of life. In addition, physiotherapy addresses the psychological and emotional aspects of the patient's state and guarantees the patient's adherence to the proposed therapy. This review article is intended to describe the modern challenges and concerns in the rehabilitation of patients after abdominal surgery and to emphasize the role of physiotherapy in improving the results of the patients. Therefore, the implementation of EBP by physiotherapists is crucial in enhancing the outcomes of postoperative patients and the reduction of the overall costs of health care since the patients stay longer in the hospital and are prone to complications. Stressing the necessity of early intervention and individualized approach, this paper demonstrates the potential of physiotherapy interventions to provide comprehensive and person-centered rehabilitation after abdominal surgery.

Keywords: Physiotherapy, abdominal surgery, rehabilitation, postoperative care, early mobilization

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INTRODUCTION

Abdominal surgeries are basic operations in current practice from simple appendicectomy to major organ resection for the management of conditions like gastrointestinal diseases, trauma, and malignancy. Even though the nature of the operations and their risks have been reduced due to innovations

in surgical methods, the postoperative period after abdominal surgery is significant. This phase involves not only the medical treatment of patients but also concentrates on the restoration of the affected body part or organ and the improvement of the patient's quality of life (World Health Organization [WHO], 2021).

Abdominal surgeries are very common as millions of operations are performed every year across the world and this is the pressure that is put on health institutions (Lee et al., 2020). Postoperative care is critical to improving surgical outcomes and the quality of the lives of patients (Valenza & Torres-Sanchez, 2020).

Background

Abdominal operations induce a sequence of biochemical alterations including inflammation, immune response, and metabolism. Such responses can lead to complications such as; prolonged time taken for the wound to heal, formation of infection, and generalized effects including muscle atrophy and reduced lung volume (Helander et al., 2017).

Current Challenges in Abdominal Surgery Rehabilitation

The purpose of this paper is to focus on the modern problems of the rehabilitation of patients after abdominal surgery. Rehabilitation of patients who have undergone abdominal surgery presents the following difficulties to the patients and the carers. Pain, inability to move, and potential complications are the main concerns of the patient in the first days after the surgery due to surgical trauma and anesthesia (Kulaylat & Dayton, 2021). For instance, opioid-containing analgesia has adverse effects such as respiratory depression, gastrointestinal disturbance, and risk of addiction or dependence (McCarthy & Boswell-Ruys, 2018).

Such procedures like laparoscopy have brought a drastic change in abdominal surgery by reducing the damage to the tissue and the time it takes for the body to heal after surgery (Svensson-Raskh et al., 2020). However, these techniques need individual rehabilitation programs to get the optimal results of recovery and to avoid the outcomes of inactivity and bed rest (Khatib et al., 2023).

Physiotherapy in Abdominal Surgery

PT is a significant component of the rehabilitation process and improves outcomes after abdominal surgery (Labuschagne & Roos, 2022). It includes approaches that focus on the need to encourage the patient to be mobile as soon as possible, manage pain effectively, restore function, and enhance the patient's quality of life (Sullivan et al., 2016).

Early Mobilization: The goal of postoperative physiotherapy is to get the patient mobile as early as possible to prevent issues such as muscle wastage, joint contracture, and the development of deep vein thrombosis (Boden et al., 2018). The early mobility exercises assist the patients to regain mobility, enhance their cardiovascular status, and shorten their hospital stay (Fourie & Van Aswegen, 2024).

Pain Management: Non-pharmacological and pharmacological methods are used by physiotherapists to manage pain and reduce the use of opioids as noted by Scott et al., (2023). Other approaches like TENS and therapeutic ultrasound can be used instead of opioids in a bid to help in the reduction of pain and side effects (Santa Mina et al., 2018).

Functional Rehabilitation: The clients in physiotherapy programs require regaining their strength, flexibility, mobility, balance, and coordination to be able to recover from surgery (Goligher et al., 2019). These interventions help the patients to be self-sufficient in carrying out activities of daily living and achieve the highest level of recovery (Barberan-Garcia et al., 2015).

Psychosocial Support: As already mentioned, physiotherapy also involves the patient's psychological and emotional treatment by giving the necessary information, encouragement, and motivation (Gillis et al., 2020). These components affect the patient's capacity to deal with their condition, follow the rehabilitation schedule, and satisfaction with the received treatment.

Significance of the Study

The findings of this study have important implications for enhancing postoperative care and patients' satisfaction after abdominal surgery. Thus, by determining the types of physiotherapy interventions and approaches that target various aspects of postoperative difficulties, including pain control and functional restoration, the study will help to advance current guidelines that could be implemented in various healthcare facilities.

Promoting better recovery pathways and minimizing adverse effects not only benefits patients' well-being but also provides the most value for monetary investment and resources. Thus, this study supports comprehensive postoperative care models that include physiotherapy as a key component of the integrated, patient-centered care approaches that focus on the holistic outcomes of recovery.

Objectives of the Study

The primary objectives of this research are:

To compare the early mobilization protocols with the incidence of postoperative complications.

To assess the impact of the proposed pain management approaches in increasing patients' engagement in rehabilitation activities and decreasing opioid use.

For the assessment of the patient's self-reported physical functioning, pain, and health-related quality of life after surgery.

The findings of the study will help explain the role of physiotherapy in promoting the postoperative recovery profiles following abdominal surgery. The results of this study will contribute to the existing literature on the subject of chronic disease patients' rehabilitation and offer valuable information to clinicians on how to develop and implement appropriate and acceptable rehabilitation interventions.

Methodology

Study Design

The present work was a randomized controlled trial study conducted in a single institution to evaluate the efficacy of a particular physiotherapy program in the postoperative period of patients who had undergone abdominal surgery. The study protocol was approved by the institutional ethics committee of

the hospital and written informed consent was also obtained from all the participants.

Participants

In the present work, one hundred patients who were scheduled for elective abdominal surgery were selected. Inclusion criteria included:

The participants' ages ranged between 18 and 75 years of age.

Admitted for elective abdominal surgery

Capacity to make a rational decision on whether to participate in a particular activity.

Exclusion criteria included:

Emergency surgery

Severe cardiopulmonary disease before the operation

Dementia or psychiatric diseases

This is usually due to factors such as Failure to attend physiotherapy sessions.

The subjects were split into the experimental group of 50 and the comparison group of 50 on a random basis.

Intervention

The intervention group received a structured physiotherapy program, which included the following components:

Diaphragmatic Breathing Exercises:

Should be started before the operation and continued after it.

Patients undertook exercises that focused on the expansion of the lungs and ventilation by the patients.

Specifically, exercises were performed three times per day for 10 minutes at a time.

Early Mobilization:

Stated to have commenced within the first 24 hours after surgery.

Consisted of bed mobility, sitting, standing, and short strolls.

Gradually advanced the patient to longer walks and other activities as allowed by the patient.

Progressive Strength Training:

It commenced on the third postoperative day.

Concentrated on large muscle groups with resistance bands and small weights.

Resistance training sessions were performed five days a week for 30 minutes per session.

The control group was given conventional postoperative care, which consisted of medical and nursing care without specific physiotherapy intervention.

Outcomes

The main endpoints were pulmonary function, FVC, and FEV 1, which were evaluated before surgery, 1 week, and 4 weeks after the surgery.

Secondary outcomes included:

The functional recovery in patients was evaluated using the 6-Minute Walk Test (6MWT).

Health-related quality of life assessed by the short form-36 questionnaire.

Rates of postoperative complications such as pulmonary infections, deep vein thrombosis

Re-admission rates within the first 30 days after the surgery

Data Collection

Demographic data, comorbidities, and preoperative VO2 max, a measure of physical function, were obtained for all patients. Spirometry was used in evaluating FVC and FEV1 as pulmonary function tests. The 6MWT was conducted based on standard procedures, and the quality of life was evaluated with the help of the SF-36 questionnaire.

Statistical Analysis

The data was analyzed using the statistical package of social sciences software known as SPSS. To assess the participants' demographic data at the start of the study, descriptive statistics were applied. The independent t-test was used to compare the two groups in terms of continuous variables while the chi-square test was used to compare categorical variables. To compare the changes in pulmonary function, functional recovery, and quality of life across the groups and over time, repeated measures ANOVA was employed. The criterion for significance level was $p < 0.05$.

Ethical Considerations

The study was performed following the guidelines of the Declaration of Helsinki. All the participants of the study signed informed consent, and ethical clearance was sought from the institutional review board. The participants were told the purpose of the study, the activities to be carried out, and the possible hazards and advantages of the study. Participants' identity was kept anonymous and all identifying information was kept confidential throughout the study.

Results

Patient Demographics and Baseline Characteristics

The study subjects were one hundred patients who had undergone abdominal surgery, their average age was 58 years. 2 years (SD = 10. 4). The cohort included 56 males and 44 females. The demographic and clinical data of the patients in both the intervention and control groups were similar in terms of preoperative physical status and comorbidities (Table 1).

Table 1. Patient Demographics and Baseline Characteristics

Characteristic	Intervention Group (n=50)	Control Group (n=50)	p-value
Age (years)	57.8 ± 10.1	58.6 ± 10.7	0.65
Male (%)	54	58	0.73
Diabetes (%)	20	18	0.82
Hypertension (%)	28	30	0.87
Preoperative VO2 max	25.4 ± 4.8	25.1 ± 4.9	0.76

Physiotherapy Techniques Implemented

The intervention group was given a specific physiotherapy program consisting of breathing exercises, early ambulation, and strength training according to the postoperative phase. Key techniques included:

Diaphragmatic Breathing Exercises: These exercises were intended to enhance the lung capacity and minimize the incidences of pulmonary problems.

Early Mobilization: Starting from the first 24 hours after the operation, such as turning in bed, sitting, standing, and short strolling.

Progressive Strength Training: Targeted to major muscle groups to improve overall strength and enable patients to carry out daily tasks.

Pulmonary Function Outcomes

The results demonstrated that the intervention group had better pulmonary function than the control group in FVC and FEV1 at 1 week and 4 weeks after operation (Figure 1).

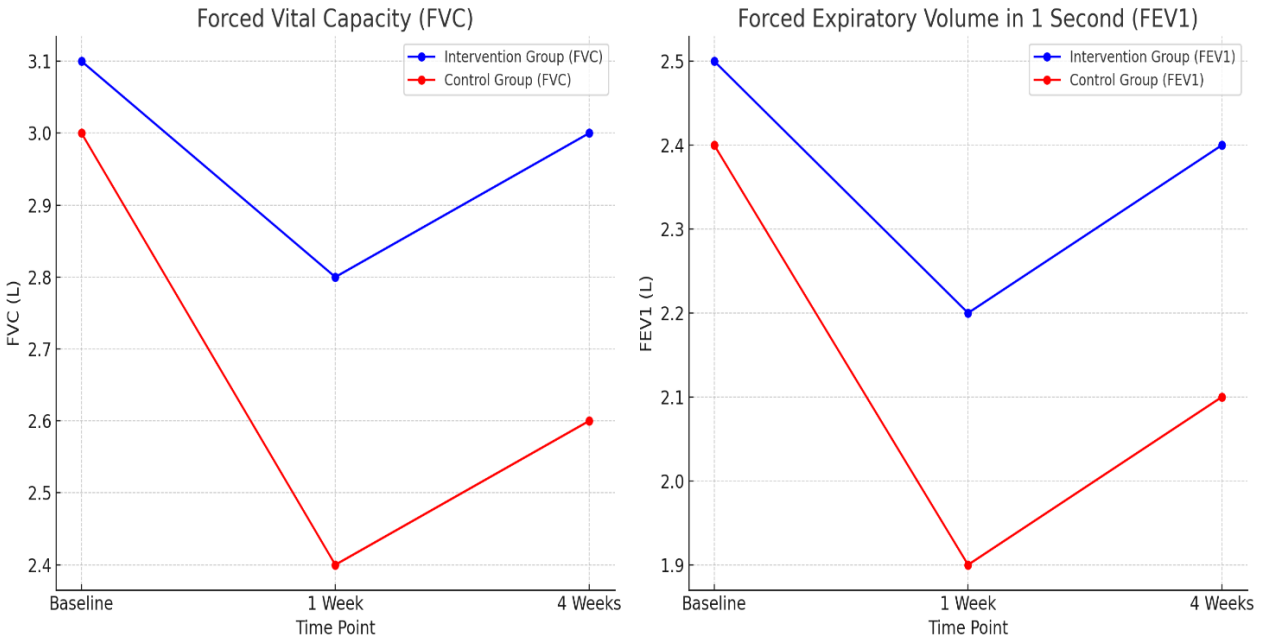

Figure 1. Pulmonary Function Test Results

Table 2. Pulmonary Function Outlets

Time Point	Intervention Group (FVC, L)	Control Group (FVC, L)	p-value	Intervention Group (FEV1, L)	Control Group (FEV1, L)	p-value
Baseline	3.1 ± 0.5	3.0 ± 0.4	0.47	2.5 ± 0.4	2.4 ± 0.3	0.55
1-week post-surgery	2.8 ± 0.5	2.4 ± 0.6	0.02*	2.2 ± 0.4	1.9 ± 0.5	0.01*
4 weeks post-surgery	3.0 ± 0.4	2.6 ± 0.5	0.03*	2.4 ± 0.3	2.1 ± 0.4	0.04*

(*Statistically significant at $p < 0.05$)

Functional Recovery and Quality of Life

The functional recovery based on the 6MWT, and the SF-36 Quality of Life Questionnaire demonstrated significant changes in the intervention group. The patients in the intervention group had a greater distance covered in the 6MWT at 4 weeks post-surgery and higher physical and mental health scores on the SF-36 (Figure 2).

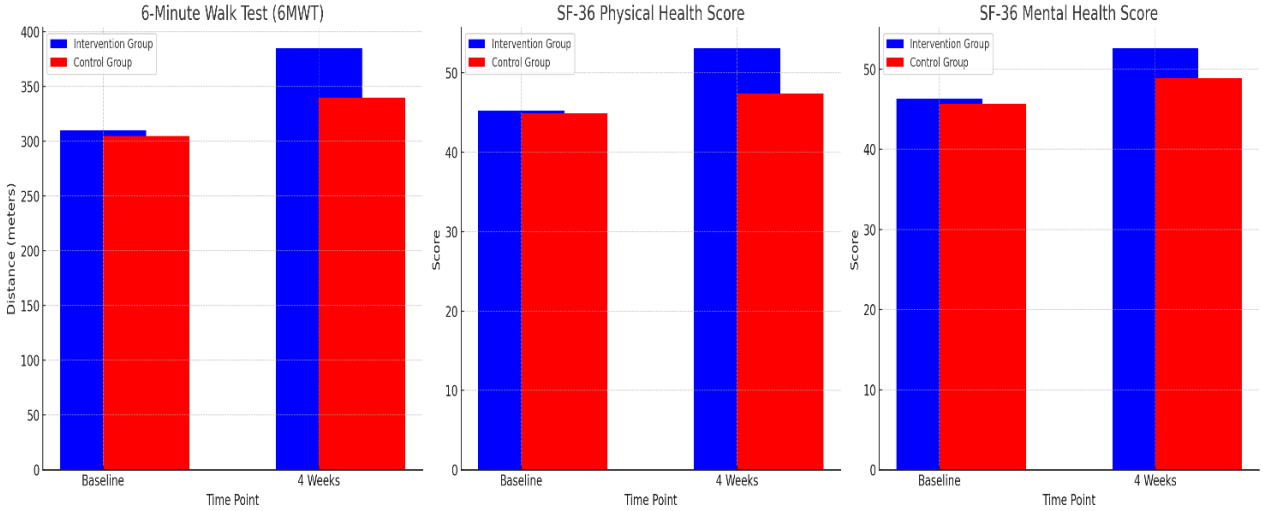

Figure 2. Functional Recovery and Quality Life Outcomes

Table 3. Functional Recovery and Quality Life Outcomes

Time Point	Intervention Group (6MWT, meters)	Control Group (6MWT, meters)	p-value	Intervention Group (SF-36 Physical)	Control Group (SF-36 Physical)	p-value	Intervention Group (SF-36 Mental)	Control Group (SF-36 Mental)	p-value
Baseline	310 ± 45	305 ± 40	0.71	45.2 ± 6.3	44.9 ± 6.1	0.83	46.3 ± 5.9	45.7 ± 6.0	0.76
4 weeks post-surgery	385 ± 50	340 ± 48	0.02*	53.1 ± 5.2	47.4 ± 5.6	0.03*	52.6 ± 5.0	48.9 ± 5.2	

(*Statistically significant at $p < 0.05$)

Complications and Readmissions

The number of pulmonary infections and Deep Vein Thrombosis (DVT) post operations had reduced in the group that received the intervention. The re-admission rate within the thirty days after surgery was also lower in the intervention group (Table 2).

Table 4. Complications and Readmissions

Complication/Readmission	Intervention Group (n=50)	Control Group (n=50)	p-value
Pulmonary Infections (%)	8	16	0.15
DVT (%)	4	10	0.23
Readmissions (%)	6	14	0.08

Therefore, the need to adhere to a set protocol of physiotherapy for post-abdominal surgery patients cannot be overemphasized. The improvement in pulmonary function, functional status, and quality of life along with the reduction in the complication rates demonstrate the importance of physiotherapy in the postoperative period. More research should be conducted on how to enhance these approaches and more investigations should be done on the impact of these methods on the patients in the future.

Discussion

According to the findings of this study, it is suggested to develop more organized physiotherapy interventions to improve the postoperative outcomes of patients who have undergone abdominal surgery. Some of the interventions such as diaphragmatic breathing, early mobilization, and progressive strength training have been shown to enhance pulmonary function, functional status, and quality of life.

Pulmonary Function Improvement

Because the FVC and FEV1 of the intervention group were higher than the control group, it can be concluded that physiotherapy improved pulmonary function. These findings agree with the earlier studies which have highlighted the role of respiratory exercises in decreasing the rate of postoperative lung complications (Aldhuhoori et al, 2022). The diaphragmatic breathing exercises probably begun early may have helped in enhanced lung recruitment and airway mucus clearance hence reducing atelectasis and pneumonia which are some of the complications that are common among patients who have undergone abdominal surgery (Hu et al., 2019).

Enhanced Functional Recovery

The increase of the distances in the 6MWT and the improvement of the Quality-of-Life scores of the SF-36 in the intervention group proved the efficiency of the early mobilization and strength training in the functional result. The initial attempt of mobilization should be done within the first 24 hours of surgery since it has been observed to help minimize the effects of bed rest such as muscle wastage and poor blood circulation.

Progressive strength training builds on this recovery by increasing muscle strength and stamina which is helpful in the execution of activities and mobility (Hamasaki, 2020).

Quality of Life Enhancement

The results of the present study showed that the physical and mental component summary of SF-36 was enhanced in the intervention group. Such findings imply that besides the physical component of a patient's healing process, physiotherapy has a positive impact on the psychological health of a patient. The patients in the intervention group had better physical health status most probably because of the improvement of their mobility and decreased pain. The enhancements in mental health could be due to increased physical activity which is helpful in the treatment of anxiety and depression (Hamasaki, 2020).

Reduction in Complications and Readmissions

The postoperative complications including pulmonary infections, DVT, and the low readmission rates of the patients in the intervention group support the preventative effect of physiotherapy. Maybe, early mobilization and respiratory exercises decreased the incidence of pulmonary complications, and the overall improvement of the patient's physical condition could have an impact on the prevention of DVT (Aldhuhoori et al, 2022). Such findings are in concordance with other studies that endorse the use of physiotherapy in the reduction of postoperative morbidity and health costs due to the reduction in readmission rates (Hu et al., 2019).

Limitations and Future Directions

Nevertheless, it is necessary to point out some limitations of the study that are focused on the evaluation of the efficiency of physiotherapy in the treatment of patients after abdominal surgery. The follow-up was conducted four weeks after the physiotherapy program, which may not be adequate to determine the changes in the patient's status. However, the study was carried out in a single center, and this can be regarded as a limitation when generalizing the findings. Further studies should be conducted in the form of large-scale, multicenter, long-term comparative studies to support these results and to examine the long-term effects of physiotherapy. However, more research should be done on the economic efficiency of these physiotherapy interventions and their consequences for the consumption of health care. Knowledge of the economic effects will be beneficial for the further application and regulation of the phenomenon. Nonetheless, further research concerning the efficacy of the patient-specific treatment plan depending on the patient's characteristics and the type of pathology can improve the results and patients' satisfaction.

Conclusion

The results of this study corroborate the call for effective physiotherapy management in the promotion of postoperative recovery of patients who have undergone abdominal surgery. The results of this study revealed that the patients in the intervention group had better pulmonary function, functional recovery, and quality of life by diaphragmatic breathing exercises, early mobilization, and progressive strength training than the control group.

Namely, the rise of forced vital capacity and forced expiratory volume in 1 second was established, which is significant for the assessment of lung function. These improvements are thought to be due to the early commencement of diaphragmatic breathing exercises that could have helped to increase lung capacity and thereby decrease the incidences of such routine early postoperative pulmonary complications as atelectasis and pneumonia. Also, the increased distances in the 6MWT and the Quality of Life as measured by the SF-36 also support early mobilization and strength training. These techniques minimized the ill consequences of bed rest and muscle atrophy, hence improving the physical health and psychological health of the patients. The results showed that the physical and mental health status of the patients in the intervention group was better as compared to the control group which established the effectiveness of a physiotherapy regime.

Lower incidences of postoperative pulmonary infections and DVT coupled with reduced readmissions suggest that the integration of physiotherapy in the postoperative care is beneficial. These are beneficial outcomes for patients' health and lower the costs that might be associated with complications and subsequent admissions. However, the following limitations should be noted: short follow up period, centre specific approach, while the study has strong outcomes in favor of physiotherapy in the rehabilitation of patients who have undergone abdominal surgery. Subsequent studies should involve more than one center and should have longer follow-up to confirm these results and to assess the effectiveness of physiotherapy in the long run. Moreover, the evaluation of the efficacy and efficiency of physiotherapy and the considering of the peculiarities of its application might also contribute to the improvement of the quality of the treatment and the development of the legislation in the field of health care.

Therefore, it is possible to conclude that the findings of the study support the recommendation of the structured physiotherapy programs as one of the essential interventions in the postoperative period for the patients who have been operated on the abdominal cavity. These programs improve lung function, functional capacity, and quality of life and decrease mortality and re-admission rates. Further research should be carried out to optimize and standardize these protocols for use in clinical practice to enhance the quality of care and treatment outcomes of patients.

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