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Reviving Vitality: An analysis of Physiotherapy's Effects on Postoperative Cases of Upper Abdominal Surgery

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Abstract

Introduction: Abdominal surgery, encompassing procedures involving organs within the abdominal cavity, is essential for addressing various medical conditions. However, recovery after upper abdominal surgery can pose challenges and often results in postoperative complications. The role of physiotherapy in enhancing recovery outcomes has gained recognition, particularly in promoting respiratory function and minimizing postoperative issues.

Objective: This study aimed to explore the impact of tailored physiotherapeutic interventions on recovery parameters following upper abdominal surgery.

Methods: A randomized case series study was conducted in patients who underwent upper abdominal surgery and were referred for physiotherapy. The study enrolled 40 patients from March 2021 to August 2022. Baseline demographic and clinical data were recorded, along with biochemical and radiological investigations. A tailored physiotherapy protocol, comprising breathing exercises, thoracic mobility exercises, incentive spirometry, and other techniques, was administered from the first postoperative day until discharge.

Results: Thoracic excursion measurements and oxygen-haemoglobin saturation were assessed as outcome measures. Results revealed significant improvements in both upper and lower thoracic excursion measurements after physiotherapy sessions, indicating enhanced chest expansion and respiratory function. Oxygen-haemoglobin saturation levels also increased significantly following physiotherapy, suggesting improved oxygenation.

Conclusion: While the study offers valuable insights,. Future research could explore larger samples, longer follow-up periods, and cost-effectiveness analyses to further validate and refine physiotherapy interventions in the context of upper abdominal surgery recovery.

Keywords: Abdominal Surgery, Physiotherapy, Recovery Outcomes, Thoracic Excursion, Oxygen Saturation, Postoperative Care.

1. Introduction

Abdominal surgery encompasses a range of medical procedures involving the repair, resection, or reconstruction of internal or visceral organs situated within the anatomical abdominal cavity. These surgical interventions may involve addressing infections, obstructions, cancerous growths, or inflammatory bowel diseases affecting organs such as the abdomen, gallbladder, liver, small intestine, spleen, large intestine (colon), pancreas, oesophagus, and appendix.[1] Abdominal surgery is categorized into two approaches based on the surgical incision's location: upper abdominal surgeries involve incisions above the umbilicus, whereas lower abdominal surgeries involve incisions below it.[2] Upper abdominal surgeries encompass a variety of incision types, including midline incisions, paramedian incisions, Kocher incisions, rooftop incisions, Mercedes Benz extensions, and thoracoabdominal incisions.[3] On a global scale, developed countries witness an annual occurrence of approximately 500 to 1000 abdominal surgical procedures per 100,000 individuals.[4] Notably, 56 out of 192 World Health Organization (WHO) member states undergo abdominal surgeries annually.[5] A substantial number, exceeding about 4 million, particularly for abdominal surgeries, are conducted in India annually.[6] Two primary types of abdominal surgeries exist: open surgery and laparoscopic surgery. Open abdominal surgery entails large incisions that provide direct visibility of the operative area but often result in extended recovery periods.[7] In contrast, laparoscopic surgery involves multiple small "keyhole" incisions through which fibre-optic instruments are inserted. Compared to traditional open surgery, laparoscopic procedures lead to shorter recovery times, quicker resumption of regular activities, and improved cosmetic outcomes.[8,9]One noteworthy consideration is the higher incidence of post-surgical pulmonary complications associated with upper abdominal surgery in comparison to procedures on other body parts. The incisions used in upper abdominal surgeries significantly alter pulmonary mechanics, leading to impaired ventilation and ineffective expectoration. These factors contribute to postoperative lung expansion failure, fostering conditions such as atelectasis and encouraging infections.[10] Studies have reported atelectasis rates ranging from 20-69%, while postoperative pneumonia rates range from 9-40%.[11]The standard abdominal surgery manoeuvre involves reconstruction of the abdomen region, which induces variations in lung capacities and lung volume.[12]

Additionally, there are reductions in arterial oxygen pressure and oxygen-haemoglobin saturation.[13] Consequently, patients may exhibit rapid and shallow breathing pattern, paradoxical movements at abdominal region, and diminished or no breath sounds, which can precipitate pulmonary complications.[14] To mitigate these challenges and enhance postoperative recovery, physiotherapy plays a crucial role in the rehabilitation of patients post open abdominal surgery. Physiotherapeutic interventions encompass a range of measures aimed at improving cardiopulmonary health and physical function, ultimately reducing the occurrence and incidence of post-surgical pulmonary complications[15]. This research article endeavours to provide a comprehensive exploration of the impact of physiotherapeutic interventions on recovery outcomes following upper abdominal surgery. By synthesizing existing literature, analysing relevant case studies, and considering clinical perspectives, this study aims to shed light on the multifaceted influence of physiotherapy on postoperative recovery parameters. The intricate interplay between surgical procedures, physiotherapeutic interventions, and patient outcomes has implications not only for healthcare practitioners but also for patients, healthcare policy-makers, and researchers. By gaining a deeper understanding of the role of physiotherapy in the perspective of upper abdominal surgery, we can potentially optimize preoperative preparations, design tailored postoperative protocols, and contribute to the broader goal of advancing perioperative care strategies.

2. Materials and Methodology

This was a randomized case series study conducted within an institutional setting. The study procedure and protocol was submitted to and approved by the Institutional Ethical Committee (IEC) of the College of Physiotherapy (COP). Following approval from COP's IEC, the study involved screening individuals who underwent upper abdominal surgery and were referred for physiotherapy. The research took place at the Department of General Surgery in Nims Medical Hospital over the course of one year, from September 2021 to August 2022. A total of 40 cases were recruited where were included as participants in the study, and informed consent was obtained priorly from all patients. The primary objective of the study was to assess changes in chest expansion and oxygen saturation in patients undergoing physiotherapy after upper abdominal surgery. To be

eligible for inclusion in the study, participants had to meet specific criteria, and a comprehensive physiotherapy assessment was conducted for all enrolled patients. The study encompassed individuals aged 18 years and older, representing both genders. We specifically focus on hemodynamically stable patients who have undergone upper abdominal surgery and have been referred for physiotherapy as part of their postoperative care. The inclusion of hemodynamically stable patients ensures that we are considering individuals who are in a stable cardiovascular state, thereby allowing us to investigate the influence of physiotherapeutic interventions on recovery without the confounding factor of significant cardiovascular instability. By examining this diverse group of patients, we aim to contribute valuable insights into the effectiveness of physiotherapeutic interventions in promoting optimal recovery outcomes after upper abdominal surgery, regardless of age or gender. This research study incorporates specific exclusion criteria to ensure the clarity and reliability of our findings. Patients with a documented history of chronic debilitating conditions, including chest trauma and pleural diseases, will be excluded from our analysis. Additionally, individuals presenting with neurological and musculoskeletal conditions that directly impact pulmonary status will not be included in the study. Patients exhibiting uncooperative behaviour and impaired cognition, which could hinder their ability to actively participate in physiotherapeutic interventions and follow protocols, are also considered as exclusion criteria. Furthermore, individuals with an unstable cardiovascular system, marked by significant instability in their heart rate, blood pressure, or other vital signs, will not form part of our study cohort. These well-defined exclusion criteria are designed to ensure a homogeneous and relevant patient population for our investigation into the influence of physiotherapeutic interventions on recovery after upper abdominal surgery.

The demographic information at the outset of the study was documented within the case report form. This included recording relevant clinical conditions, baseline clinical parameters assessed prior to the surgical procedure, and the performance of pertinent biochemical tests. Additionally, radiological assessments, such as chest X-rays, were conducted. Details concerning the nature of the surgery, its duration, as well as the specific anaesthesia techniques and drugs administered during the procedure were meticulously recorded. Intraoperative and post-operative complications were carefully documented throughout the study period. A tailored physiotherapy treatment protocol, as illustrated in Figure 1, was initiated from the first day following surgery and continued until the day of discharge. Evaluations of patient progress were conducted on the second day post-surgery, the fifth day post-surgery, and on the seventh day post-surgery, which coincided with the discharge date.

Outcome measures were taken in form of thoracic excursion measurement using measure tape and saturation of oxygen (SpO2) using pulse oximeter. The subjects were delivered with a detailed explanation about the study and its purpose and the measurement technique to ensure their understanding. The specific area to be assessed was with permission of the subject, exposed to facilitate accurate measurements. Patients were instructed to attain a comfortable position, and measurement around the thorax were taken at two distinct levels: the Upper Thoracic Level and the Lower Thoracic Level. For the Upper Thoracic Region, measurements were obtained by identifying the point A on the 5^{th} spinous process at the back and point B over the 3rd intercostal space at the mid-clavicular line at the front. In the case of the Lower Thoracic Region, measurements were taken as point A on the 10^{th} thoracic spinous process to the point B at tip of the xiphoid process. A marker pen was employed to mark the reference points for tape placement to ensure consistency. Measurement readings were recorded while keeping the measuring tape placed evenly against the subject's skin surface at the end of both deep and full inspiration and expiration. Care was taken to ensure that the tape was held securely i.e. not too tightly or loosely so as to maintain the outline and contour of the soft tissue. A total of 3 measurements were acquired for individual subject, with readings taken on the 1st, 5th, and 7th post-operative days for comprehensive data collection. Tailored physiotherapy treatment was given in form of breathing exercises (diaphragmatic breathing exercise and segmental expansion exercise), thoracic mobility exercise, incentive spirometry, coughing and huffing technique and ambulation.

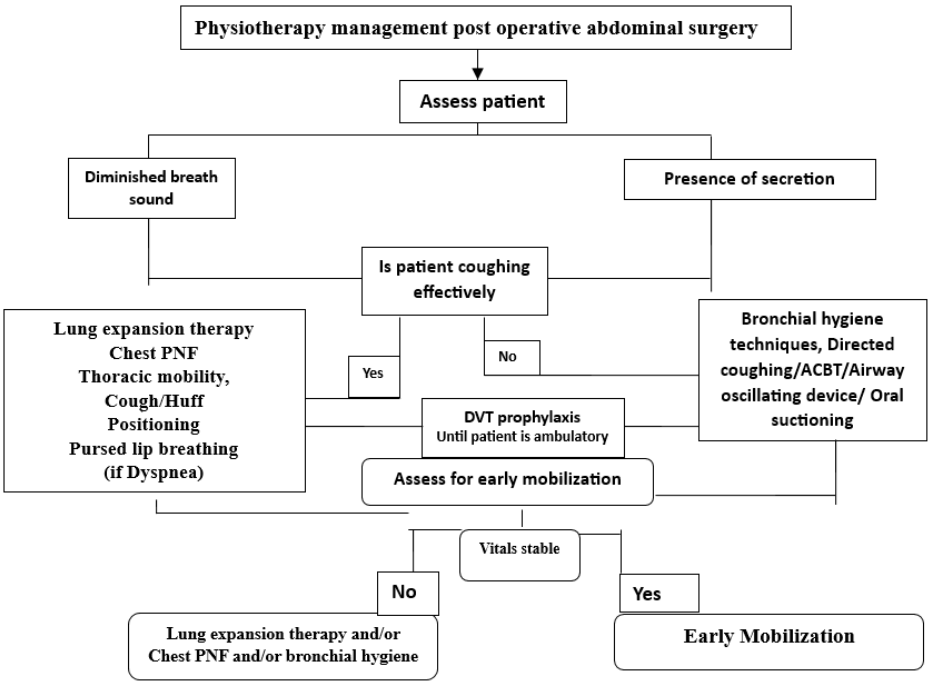

Figure 1. Tailored Made physiotherapy management in postoperative abdominal surgery

3. Statistical Analysis

The gathered data underwent analysis through the utilization of computer software, SPSS 26.0 designed for the Windows platform. The collected data was analysed according to descriptive statistical analysis, allowing for an insightful overview. To gauge statistical significance among the proportions, the Chi-square test was employed. To convey the extent, the incidence was computed along with 95% confidence intervals. A 'P' value below 0.05 holds significance from a statistical perspective, unless established otherwise. It is imperative to appropriately address confounding factors using suitable adjustment techniques.

4. Result

In our current investigation, the age of the participants displayed a wide range, spanning from 16-75 years. The range of the study's subjects fell between the age bracket of 31 to 60 years, with an average age of 43.80±13.08 years and 44.80±13.47 years, respectively.

Table 1: Age Distribution

Age Group	Study Group (IS) (n=40)	
	Frequency	Percentage
18-30 years	5	15.0
31-40 years	10	22.5
41-50 years	11	30.0
51-60 years	9	20.0
61-70 years	3	7.5
71-80 years	2	5.0
Total	40	100.0
Mean Age	44.80±13.47	

Table 2: The distribution of gender among the study participants

Sex	Study Group (IS) (n=40)	
	Frequency	Percentage
Male	30	77.5
Female	10	22.5
Total	40	100.0
Statistical Inference	p value of 0.446	

Regarding gender distribution we found comparable data with a p-value of 0.436. Data is shown in [Table 2].

Table 3: assessment of various anthropometric variables

Variables	Study Group (n=40)		p value
	Mean	±SD	
Height (cm)	160.10	±5.58	0.967
Weight (kg)	72.17	±5.48	0.175
BMI (kg/m2)	26.26	±3.05	0.135

Based on our analysis, we determined the mean levels of several anthropometric variables, including height (measured in centimeters, cm), weight (measured in kilograms, kg), and BMI (Body Mass Index, measured in kg/m^2). The data summarizing these findings is presented in [Table 3].

Table 4: Laboratory Parameters at Baseline

Variables	Study Group (n=40)		p value
	Mean	±SD	
Hb% (gm%)	13.82	±1.36	0.975
TLC (per micro litres)	10417	±12794.44	0.185
ESR (mm/hr)	18.82	±4.87	0.315
RBS (mg/dl)	126.20	±24.22	0.965
Urea (mg/dl)	21.30	±4.97	0.574
Creatinine (mg/dl)	0.87	±0.12	0.433
Sodium (mEq/L)	141.39	±2.91	0.535
Potassium (mEq/L)	4.46	±0.47	0.321
Total Bilirubin (mg/dl)	0.74	±0.09	0.440
Albumin (g/dl)	4.42	±0.59	0.411
SGOT (IU/L)	35.95	±14.57	0.600
SGPT (IU/L)	44.90	±14.58	0.589
ALP (IU/L)	80.57	±18.75	0.069

Table 5: Comparing Upper Thoracic Excursion Measurements

Upper thoracic excursion measurement	Mean	SD	P VALUE
1st Post op day	2.22	.61	0.001
1st Post op day	3.40	.76	
1st Post op day	4.52	.68	

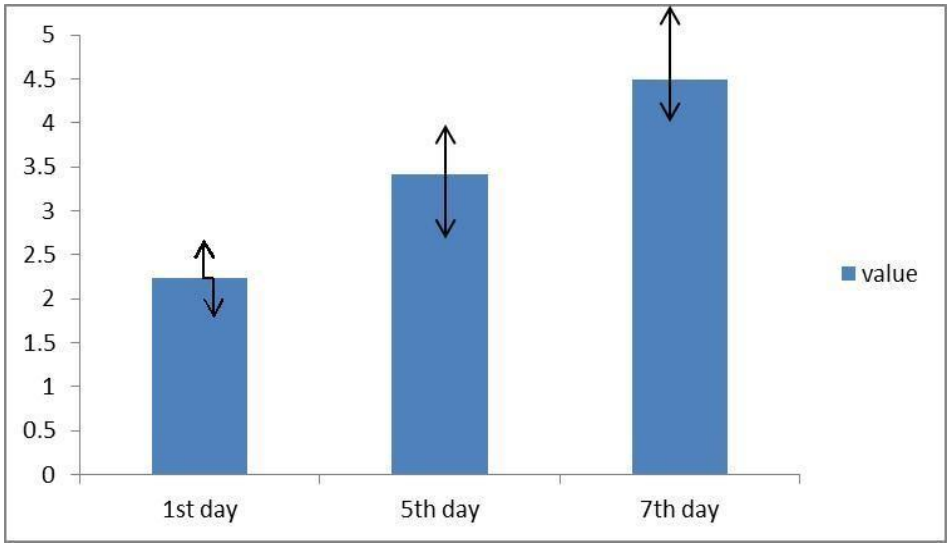

Fig 2: Scores evaluated after the administration of physiotherapy sessions indicated a significant impact on upper thoracic excursion measurements, as depicted in Figure 2.

Table 6: Comparing Lower Thoracic Excursion Measurements

Lower thoracic excursion Measurement	Mean	SD	P Value
1st post op day	2.12	.48	.001
5th post op day	3.08	.59	
7th post op day	3.81	.31	

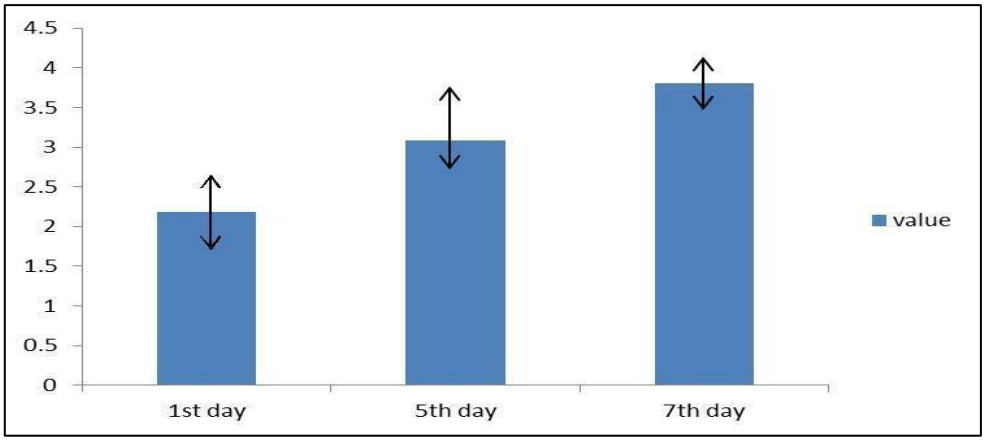

Fig 3: Following the physiotherapy sessions, patient assessments showed a notable impact on lower thoracic excursion measurements, as illustrated in Figure 3.

Table 7: Oxygen-haemoglobin saturation before and after the in physiotherapy

Post-Operative Day	Before Physiotherapy (mean ±SD)	After Physiotherapy (mean ± SD)	P Value
1st Post op day	93 ± 1.0	94.7 ± 1.5	< 0.001
5th Post op day	94.7 ± 1.5	96.0 ± 1.5	
7th Post op day	96.0 ± 1.5	97.0 ± 1.2	

The oxygen-haemoglobin saturations found from 1st post-operative day to 7th post-operative day showed higher values after physiotherapy.

5. Discussion

The present study intends to find and examine the impact of physiotherapeutic interventions on recovery outcomes following upper abdominal surgery. Abdominal surgeries involving organs such as the gallbladder, intestines, liver, and more, are essential procedures that often lead to challenges in postoperative recovery. The utilization of physiotherapy in these cases has gained recognition due to its potential to enhance respiratory function, minimize pain, and improve overall recovery experiences for patients. One of the key findings of this study is the positive influence of tailored physiotherapy interventions on thoracic excursion and oxygen saturation levels. Upper and lower thoracic excursion measurements, indicative of chest expansion and respiratory function, showed significant improvements after physiotherapy sessions. This aligns with existing literature that highlights the role of physiotherapy in preventing postoperative pulmonary complications.[16,17] Improved chest expansion is crucial for preventing atelectasis, a common postoperative issue that arises due to reduced lung volumes and capacities resulting from abdominal surgery[18]. The observed increase in oxygen-haemoglobin saturation after physiotherapy further underscores the beneficial impact on respiratory function, which can contribute to better overall recovery.[19]

The tailored physiotherapy protocol implemented in this study consisted of various interventions, including diaphragmatic breathing exercises, segmental expansion exercises, thoracic mobility exercises, incentive spirometry, and coughing techniques. This multifaceted approach is in line with recommendations from recent studies that advocate for a combination of techniques to address the complex challenges posed by upper abdominal surgery recovery.[20,21] Each component of the physiotherapy protocol aims to address different aspects of recovery, such as maintaining lung volumes, enhancing respiratory muscle strength, and promoting effective coughing to clear airway secretions.

6. Conclusion

In conclusion, this research article delves into the impact of physiotherapeutic interventions on recovery outcomes following upper abdominal surgery. The observed improvements in thoracic excursion, oxygen saturation, and overall respiratory function demonstrate the potential of tailored physiotherapy protocols in enhancing postoperative recovery. By shedding light on the intricate interplay between surgical procedures, physiotherapy interventions, and patient outcomes, this study contributes to advancing perioperative care strategies, ultimately improving the quality of patient rehabilitation and care provided to patients who were exposed to upper abdominal surgery.

Clinical Implications: The results of this study hold significant clinical implications for patients, healthcare practitioners, and policy-makers alike. By demonstrating the effectiveness of physiotherapy interventions in improving recovery outcomes after upper abdominal surgery, this research underscores the importance of integrating physiotherapy into postoperative care protocols. Given the rising number of abdominal surgeries performed annually globally, optimizing perioperative care strategies is paramount. Physiotherapy's potential to mitigate the risk of postoperative pulmonary complications and enhance overall recovery experiences positions it as a valuable tool in improving patient outcomes.

7. Limitations and Future Directions

While this study provides valuable insights, certain limitations should be acknowledged. The study's sample size is relatively small, and the short follow-up duration may limit the generalizability of findings to broader populations and longer recovery periods. Future research could involve larger sample sizes, longer follow-up periods, and potentially explore the impact of different physiotherapy protocols on specific patient subgroups. Moreover, evaluating the cost-effectiveness of incorporating physiotherapy into standard postoperative care could offer valuable insights for healthcare decision-makers.

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Author's contribution: All authors have made equal contributions towards the notion and design of the study, data collection and analysis, results' interpretation, as well as the preparation and revision of the manuscript. The authors collaborated closely to maintain the research's integrity and accuracy as presented in the article.

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