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Mini Review

Effectiveness of Preoperative Breathing Exercise Interventions in Patients Undergoing Cardiac Surgery

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Abstract

Postoperative pulmonary complications are a common cause of morbidity and mortality in individuals who have had heart surgery, prolonging hospital stays and increasing medical costs. Cardiovascular surgery patients may benefit from preoperative breathing therapies that reduce postoperative pulmonary complications, shorten hospital stays, and improve respiratory function after surgery.

Keywords: Breathing exercises • Heart surgery •Preoperative intervention • Postoperative complications • Rehabilitation

Introduction

Cardiovascular disease is the main cause of death and hospital admission. Cardiac surgery becomes a possibility when less invasive treatment options are no longer effective. The two most common cardiac surgeries are coronary artery bypass grafts and heart valve replacements. Despite the use of cutting-edge methods and materials that make the procedure safe, cardiac surgery has risks. Depending on how the issues are defined, the reported incidence of postoperative issues ranges from 5% to 90%. Postoperative Pulmonary Complications (PPC), which restrict chest movement and lung expansion after cardiac surgery, are frequent and are caused by anaesthesia, surgical procedures, and discomfort [1,2]. PPC may be present in up to 70% of cases, with pneumonia and atelectasis accounting for only 24.7% of cases, and hypoxemia and pleural effusion making up the remaining 70%. Typically, a median sternotomy is used to do heart surgery; sternal pain is common in patients and has been reported to be a risk factor in the days immediately following surgery, causing the patient to adopt a restricted and shallow breathing pattern. After CABG, poor functional capacity has been linked in part to decreased respiratory muscle strength. Preoperative respiratory dysfunction increases the likelihood that a patient may require postoperative mechanical breathing for a longer period of time following cardiac surgery to replace a heart valve. The respiratory muscle strength is not decreased two months after heart surgery as compared to preoperative values. Despite this, the study found that the maximal inspiratory pressure decreased by 36% at six days after surgery and by 11% at five days. The inability to effectively do the exercises and sternal pain during the initial postoperative phase may be responsible for these results. A sternotomy reduces the chest wall's compliance and breathing ability [3]. Patients recovering from cardiac surgery have been successfully treated with breathing exercises. By engaging in these activities, patients can reduce their risk of PPC, functional capacity impairment, and Length of Hospital Stay (LHS) associated with early postoperative pulmonary function decline. The positive impact on functional capacity, decreased PPC, and LHS following cardiac surgery has been confirmed by systematic reviews of both preoperative techniques and breathing therapy combined with physical exercise, demonstrating the effectiveness of preoperative exercises in lowering postoperative complications. However, it appears that Inspiratory Muscle Training (IMT) alone is efficient in lowering PPC following cardiac surgery [4].

Discussion

The results of these investigations showed a decrease in PPC, including pneumonia or atelectasis, and LHS, as well as an improvement in respiratory metrics that were assessed both pre- and postoperatively. There is no difference between IC and CG, according to five studies evaluating the duration of stay in critical care units. According to the majority of studies, improving preoperative breathing can lower PPC and LHS while enhancing postoperative respiratory efficiency. The strength of the inspiratory muscle improved in all trials that used an IMT programme using threshold and/or incentive spirometers. Higher pulmonary function was the consequence, which may reduce the risk of PPC. The results demonstrated that preoperative IMT could reduce the possibility of PPC occurrence. While the review covers various types of breathing therapy, the authors solely examined the effects of IMT [5]. Studies that used breathing therapy alone reported better respiratory function and a decline in LHS. All study participants were scheduled for heart surgery, although only three studies included CABG and/or valve operations, compared to the majority of studies that exclusively included CABG operations. The patient's recovery could be significantly impacted by this discrepancy. The majority of studies did not adequately define the surgical approach; in two studies, the median sternotomy was the only reference to the surgical strategy. The stability of the thoracic wall is compromised when an Internal Mammary Artery (IMA) is removed together with a median sternotomy. The strength of the intercostal muscle is thus decreased due to a reduction in sanguineous support. According to one source, all patients in the IG and CG received CABG using IMA, saphenous vein grafting, or a combination of techniques, with patients in each group being evenly divided. Due to the advancement of minimally invasive techniques for traditional heart surgery, which allow access to the heart through a partial sternotomy for the majority of aortic valve procedures and a sternotomy-free mini-thoracotomy for other procedures, the rate of postoperative complications is decreasing. In order to support the heterogeneity found in meta-analysis, it is necessary for authors to declare any surgical procedures or techniques that may have an impact on the results of their studies. Understanding postoperative surgical pain management is essential to understanding the outcome of any intervention since the success of any intervention depends in large part on proper pain management in the early days following a cardiac surgical surgery. There was no information on a postoperative pain management strategy in any of the trials that were considered [6].

Reduced respiratory muscle strength and ventilatory capacity were observed in patients who underwent cardiac surgery after the procedure. Postoperative therapies like breathing therapy and early mobilisation may affect outcomes like a decrease in PPC and LHS due to an incidence of atelectasis and pneumonia when patients understand their involvement in deep breathing and coughing exercise technique to minimise surgical complications. Deep breathing exercises were performed by IG patients with a threshold similar to that used in the preoperative period. Coughing was encouraged throughout the exercises, which started an hour after extubation and lasted through the eighth postoperative day. On the second day, all of the patients (IG and CG) were moved from their beds to chairs and encouraged to take quick strolls. The patients were allowed to roam around freely on the third day [7]. The CG got routine breathing therapy and early mobilisation, much like it was done for the IG. Following surgery, incentive spirometry, chest physical therapy, and mobilisation exercises were performed on both research groups.

In addition to standard physiotherapy, which was given twice daily, study participants also got physiotherapy based on ward practises. Some studies claimed that both groups engaged in early mobilisation and/or respiratory therapy exercises throughout the postoperative period without going into detail about the exercises. Physical therapy or postoperative breathing therapies were not mentioned at all in four additional trials. The authors that discussed the postoperative exercises asserted that both groups received similar postoperative plans, with the exception that they only provided the IG's threshold. The variation we saw may be due to the differences we noticed in the postoperative period as well as the lack of data from the majority of studies [8]. High statistical heterogeneity is shown in the majority of performed meta-analyses. The variance in study results could be brought about by methodological or clinical heterogeneity, the choice of the wrong treatment impact assessments, or even chance. The included studies' designs differed in terms of randomization, allocation secrecy, blinding, losses/exclusions, and participant and staff blinding; nonetheless, none of the investigations were successful in achieving this. These are a few examples of murky disparities in study designs that could impair the results. Clinical heterogeneity describes differences in study parameters such participant age, surgical technique, or postoperative therapies. Study type, such as an RCT or cohort study, or participant numbers, may have an impact on clinical variables [9].Small sample sizes and the inclusion of few trials reduce the power of the test for detecting heterogeneity, adding to its complexity. With time and additional study being completed and incorporated into the evaluation, it is predicted that the conclusions won't be problematic. When there is variation and unpredictability, as there was in our evaluation, the random effects technique is used because it distributes the weight in a more consistent way and emphasizes the contribution of little research. The meta-analyses conducted on the subgroup of older individuals revealed no heterogeneity. This resulted from two studies involving senior citizens that were conducted by the same researchers and had equivalent study designs. One of these investigations was a pilot study (weight 9.3%), while the other was the final study (weight 83%). These investigations, which showed the increased utility of a preoperative breathing treatment intervention, were carried out with older volunteers at high risk of developing PPC. Additionally, a study with less significance discovered comparable statistical outcomes, which makes us think that this might not be a casualty. However, we think it's essential to carry out further studies on senior citizens in order to assess the benefits of preoperative breathing therapy [10].

Conclusion

It is generally recognized that readmission therapy have the potential to reduce PPC and LHS, especially in older heart surgery patients. Some studies try to distinguish between the effects of each intervention. The literature study does not provide evidence for a relationship between preoperative physical activity and better outcomes from heart surgery.

Do breathing exercises have an impact on recovery from surgery then? The study found that employing threshold, IMT lowers the risk of pneumonia and atelectasis. But is using this apparatus—which can increase costs and demand more time from medical staff—required? Or are all forms of breathing exercises equally effective? This study appears to support the use of any form of breathing therapy programme that is successful in boosting respiratory parameters and lowering PPC and LHS, while more research with a larger sample size is necessary. According to our research, preoperative breathing treatments for heart surgery patients may improve respiratory function and aid in subsequently lowering PPC and LHS. However, the observed heterogeneity may compromise these results.

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