

Chest Tube Management: Past, Present, and Future Directions for Developing Evidence-Based Best Practices

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Abstract

In the field of modern cardiothoracic surgery, chest drainage has become ubiquitous and yet characterized by a wide variation in practice. Meanwhile, the evolution of chest drain technology has created gaps in knowledge that represent opportunities for new research to support the development of best practices in chest drain management. The chest drain is an indispensable tool in the recovery of the cardiac surgery patient. However, decisions about chest drain management—including those about type, material, number, maintenance of patency, and the timing of removal—are largely driven by tradition due to a scarcity of quality evidence. This narrative review surveys the available evidence regarding chest-drain management practices with the objective of highlighting scientific gaps, unmet needs, and opportunities for further research.

Keywords

chest tube drain, cardiothoracic surgery, retained blood syndrome

Introduction

Chest drains have been used for centuries to treat infection, pneumothorax, effusions, and military and civilian thoracic trauma,^{1–3} and in the era of modern cardiothoracic surgery, they are a ubiquitous tool for managing shed mediastinal blood, non-bloody effusions, air leaks, and drainage of infected spaces. However, despite their long history of use, chest drains remain “neglected” in a scientific sense. Their use varies widely between and within institutions,⁴ governed chiefly by traditions passed down from mentor to trainee or through institutional standards of care. Many of these traditions have not been vetted through the process of evidence generation, systematic review, and creation of evidence-to-decision frameworks.^{5–9} Consequently, chest drains are a necessary tool being used within an unnecessarily complicated system rife with variability and unpredictability—a state that is antithetical to delivery of safe, high-quality, value-driven health care.^{10,11}

For the cardiac surgeon, the meticulous monitoring and management of chest tube drainage and residual fluid collection is of critical importance to surgical outcomes. While a small volume of residual blood is to be expected within the mediastinum after cardiac surgical procedures, there is growing evidence that some of the complications that arise after cardiac surgery, such as pericardial and pleural effusions,

tamponade, and postoperative atrial fibrillation (POAF), correlate with pooling of shed mediastinal blood and persistent exposure to mediators of inflammation.^{12–17}

Given the adverse effects associated with retained blood, other fluids, or air in thoracic spaces^{12–18} and a lack of high-quality evidence for mitigating these complications, there exists a tremendous opportunity to improve the science and, with it, the consistency, safety, and quality of care and, ultimately, postoperative outcomes. The purpose of this narrative review is to examine the state of the field over approximately the past 20 years and inspire clinicians to think about how they manage chest drains: why they do it the way they do, whether or not there is current evidence to support their practices, and what kinds of data they might contribute to the field that could improve clinical consistency and patient outcomes. We review the key variables and other considerations for the design of robust quality improvement or investigator-initiated studies of

Central Message

This review article examines chest tube management over the last 20 years to encourage clinicians to evaluate how they manage chest drains.

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