Official study title: Ventilation During Intensive Care Unit Transport After Cardiac Surgeries; When Should we Use a Ventilator?

NCT06006208

Date: July 6, 2023

PROTOCOL

Title: Ventilation During Intensive Care Unit Transport After Cardiac Surgeries; When Should we Use a Ventilator?

This study was approved by the institutional review board of Thomas Jefferson University (iRISID-2023-1921), and verbal informed consent was obtained from all participants before enrollment. The trial was registered at ClinicalTrials.gov (NCT06006208) on August 23, 2023

Study design

This single-center, prospective clinical trial was conducted at a tertiary academic hospital.

Study participants

Patients aged > 18 years who underwent full sternotomy cardiac surgery and required postoperative ICU care were included in the study. The exclusion criteria included extubation in the operating room, postoperative need for mechanical circulatory support, postoperative open chest, and continuous inhalation of epoprostenol or nitric oxide.

For data analysis population, patients who needed to be switched the ventilation method from the originally designated method were excluded.

Eligible patients were randomized to either (1) manual ventilation using an AMBU bag (AMBU, Copenhagen, Denmark) or (2) mechanical ventilation using a Hamilton C1 ventilator (Hamilton Medical, Reno, NV) during transport to the ICU. Each participant provided verbal consent without knowing which arm they were assigned to. The anesthesiologist made the final decision regarding the ventilation modality based on the post-cardiopulmonary bypass biventricular function and PaO_2/FiO_2 or $PaCO_2$ levels.

Primary outcomes

The primary outcomes included hemodynamic parameters before and after ICU transport. Hemodynamic indices mean arterial pressure (MAP). Pre-transport hemodynamic values were averaged from the final three readings (taken at 1-min intervals) before switching to the transport monitor, and post-transport readings were recorded immediately after transfer to the ICU monitor. Significant hypotension was defined as > 20% decrease in MAP between pre- and post-transport. The transport time began when the patient was switched to manual or mechanical ventilation and ended when the patient was switched to an ICU ventilator.

Secondary outcomes

The secondary outcomes were the change in PaO2/FiO2 ratio, PaCO2 levels, and biventricular function before and after ICU transport. Pre-transport arterial blood gas (ABG) samples were obtained when the patient was ready to leave the operating room, and post-transport ABG samples were collected immediately upon arrival in the ICU. Left ventricular (LV) and right ventricular (RV) functions were visually assessed using VScan AIR SL (GE Medical, IL) transthoracic echocardiography (TTE) in the apical four-chamber and parasternal mid-papillary short-axis views before and after transport. Biventricular function was graded as moderate-to-severe hypokinesis (grade 1), mild hypokinesis (grade 2), normal (grade 3), or hyperkinesis (grade 4).

Point-of-care ultrasound (POCUS) training

Cardiac anesthesiologists received on-site training from a GE Healthcare representative on the assessment of biventricular function using the VScan Air ultrasound device.

Anesthesia and ventilation protocols

General anesthesia was induced via endotracheal intubation, and arterial, central venous, and pulmonary arterial lines were placed alongside the transesophageal echocardiography. The selection of anesthetic agents, inotropes, vasopressors, transfusion strategies, and fluid management was at the discretion of the attending anesthesiologist. Dexmedetomidine 0.7–1.0 mcg/kg/h was used for sedation during the transport to the ICU.

For manual ventilation, the AMBU bag technique, including the PEEP valve setting (5–10 cmH2O), was performed by each anesthesiologist. For mechanical ventilation using the Hamilton C1 ventilator, the respiratory therapist configured the ventilator to deliver a tidal volume and respiratory rate consistent with the final operating room settings (tidal volume: 6–8 mL/ideal body weight [kg], respiratory rate: 14–16 breaths/min, PEEP: 5–10 cmH2O, and FiO2:100%). Airway pressure and end-tidal CO2 levels were not monitored during transport.

Sample size determination and statistical analysis

Sample size calculations were based on prior clinical experience and data from a previous study.3 We hypothesized that 0% of patients receiving mechanical ventilation would experience a decrease in MAP during transport compared with 28% of those manually ventilated with an AMBU bag. With an alpha level of 0.05 and 90% power, we estimated that 38 patients per group (N = 76) would be required.

Summary statistics are presented for the demographic and clinical variables in each group. Continuous variables are expressed as mean ± standard deviation (SD) or median (interquartile range [IQR]), as appropriate. Categorical data are summarized as frequencies

and percentages. Group comparisons were performed using the independent t-test or Mann–Whitney U test for continuous variables. Correlations between two continuous variables were assessed using Pearson's or Spearman's rank correlation test. Receiver operating characteristic (ROC) curve analysis was used to assess the accuracy of the predictive value of SVR for > 20% drop in MAP. Statistical significance was set at $p < 0.05$. All statistical analyses were performed using EZR (Saitama Medical Center, Jichi Medical University, Saitama, Japan), a graphical user interface for R (R Foundation for Statistical Computing, Vienna, Austria). More precisely, this is a modified version of R commander designed to add statistical functions that are frequently used in biostatistics.

Jefferson Office of Human Research
Verbal Consent with Optional Use of Disclosure of PHI
OHR-8H
Version Date – FOR OHR USE: 1/20/20

Department: Anesthesiology

Principal Investigator: Yoshihisa Morita

Study Title: Ventilation during intensive care unit transport after cardiac surgeries; when should we use a ventilator?

Lay Title: AMBU bag manual ventilation vs. transport ventilator mechanical ventilation for transporting cardiac patients

Hello, my name is _____. I'm from Jefferson's Department of Anesthesia, cardiac anesthesia division.

I am contacting you because I obtained your contact information from your surgeon's surgery schedule.

We are conducting a research study that consists of asking you questions about your past medical history and scheduled surgery and assessing your oxygenation and ventilation during transport to the ICU (Intensive Care Unit) after your heart surgery. This will take about 10 minutes to complete. About 51 people will take part in this research at Jefferson and about 51 in the whole study.

The purpose of this research is to compare the use of manual ventilation to mechanical ventilation to support your breathing while you are being transferred to the ICU after your heart surgery. After cardiac surgery, unless the endotracheal tube (breathing tube) is removed in the operating room (OR), patients remain intubated and breathing is supported manually or mechanically, with a ventilator, depending on the situation. The decision on ventilatory method is based on patients' health factors, surgical factors, and surgeon preference, but mostly made based on your anesthesiologist and/ or surgeons previous experience during this critical time, due to lack of clinical research evidence. . We are planning to explore this concept in real situations and gather more clinical data to support more evidence based decisions. Both manual and mechanical ventilation are standard of care. You will be randomly assigned to manual ventilation or mechanical ventilation, but mechanical ventilation will be chosen if it is medically indicated during the surgery The decision will be made by your anesthesia provider based on your respiratory

status after cardiopulmonary bypass, before you are transported to the ICU following surgery.

The alternative to being in this study is to not take part. Your participation is voluntary. It is your choice whether or not you want to take part. If you choose not to take part or choose to stop taking part at any time, there will be no penalty or loss of benefits that you would normally get.

You may or may not personally benefit from taking part in this research. Some of the possible benefits may be availability of more detailed clinical data (such as heart function assessment with echocardiography before and after transport) which may lead to proactive interventions, if needed, to provide a better outcome for you or patients in the future.

A risk of taking part in this study is that you may not feel comfortable answering some of the questions. If any question makes you feel uncomfortable, you do not have to answer the question.

The other possible risk is a loss of the confidentiality of your information. Your information will be de-identified for data analysis. Information will be collected about you for this study. The information will be seen by the people involved with this research. Steps will be taken to protect your identity. But the information collected about you can never be 100% secure.

The other possible risks are that a ventilator machine or manual ventilation can be dysfunctional or accidentally disconnected from the breathing circuits. These risks are very unlikely given that our devices are routinely maintained by our BioMedical technicians and manual ventilation will always be available. Manual ventilation will be done with a new AMBU bag for each patient.

There will be no cost to you for taking part in this study. You will not be paid for taking part in this study. If this research or the information you provide results in commercial profit, you will not receive any money.

HIPAA (Health Insurance Portability and Accountability Act) – This is the law that protects your personal health information.

To do this study, we need to collect, use, and share your personal health information. I will explain why your information is being collected, what information will be collected, and who will have access to it. By agreeing, you are giving us permission to use your information as described in this form.

We are committed to respecting your privacy and to keeping your personal health information confidential. Your personal health information includes the

information in your health care records and information that can identify you. For example, personal information may include your name, address, phone number, social security number, and medical information. The personal health information that may be collected, used, and shared for this research includes:

- Information from your medical records, Demographic information such as name, gender, birth date, ethnicity (required if research is federally-funded), medical history, and health care providers, Physical examinations, procedures, tests, labs, your medical conditions, and medications you use, Information collected about any research related injury.

Your personal information will be used by and shared with the following:

- Personnel at Thomas Jefferson University and its affiliates for the purpose of this research
- Institutional Review Board (ethics committee that reviews research) including Thomas Jefferson University IRB
- Health insurance providers
- Others as required by law

When your personal information is provided to some of the people listed, it may no longer be protected under the HIPAA privacy law. You can see your health care records at any time. However, generally you will not be able to see your study records or the study results until the study is completed. A copy of this signed form, information about this study, and the results of any study test or procedure may be included in your health records which may be seen by your insurance company and your health care providers.

This authorization does not have an expiration date. If you want to end your permission to collect your information, please inform the investigator in writing. If you do this, no more information will be collected, but the information already collected will still be used. If you end your permission to use your personal information, you will not be able to continue in this study.

The information from this study may be published in scientific journals or presented at scientific meetings, but you will not be personally identified.
Your private information and specimens, with the identifiers removed, could be used for future research studies or distributed to other researchers for future research studies without your additional permission.

Do you agree to participate in this research study as it has been described to you?

If you have any questions about this research, you can contact:

Name: Yoshihisa Morita, Phone Number: 215-955-6161, Email: Yoshihisa.morita@jefferson.edu

If you need to contact someone other than the study personnel about a concern or your rights as a research subject, please call the Jefferson IRB at: 215-503-0203, 215-503-8966, or 215-955-4239.

Investigator writes name of participant and signs to verify verbal response of subject:

Name of research participant _____

□ YES, the participant consented □ NO, the participant did NOT consent

_____ _____

Name of Investigator Signature of Investigator
Date

Following the verbal consent procedure, the research subject must be provided with a separate letter or information card that clearly identifies a contact person within the department. If the researcher does not already have the subject's address, then this information must be collected during the phone interview. The letter or information card must be part of the first written communications to the subject. The letter or information card must include the following:

Thank you for participating in our research study. If you have additional questions or concerns, please contact:

1. Contact person name and title:
   Yoshihisa Morita, MD Department/Division address:
   Cardiac anesthesia.
   Thomas Jefferson University Hospital.
   111 South 11th street, Suite 8130V Gibbon Bldg
   Philadelphia, PA 19107-4824

Department/Division telephone and FAX numbers: 215-503-6476 (P), 215-955-0677 (F)

2. If you need to contact someone other than the study personnel about a concern or your rights as a research subject, please call the Jefferson IRB at: 215-503-0203, 215-503-8966, or 215-955-4239.