

# A Method for Mediastinal Drainage After Cardiac Procedures Using Small Silastic Drains

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**Background.** It has been standard teaching in cardiac surgery that drainage of the mediastinum following cardiac surgical procedures is best accomplished using rigid large-bore chest tubes. Recent trends in cardiac surgery have suggested less invasive approaches to a variety of diseases. Difficult drainage problems in the field of general surgery including hepatic and pancreatic collections have been drained successfully with smaller flexible drains for many years. Additionally, many difficult to reach collections in the chest have been drained by invasive radiologists using small pigtail catheters.

**Methods.** We have introduced drainage of the mediastinum using 10-mm flexible, flat, fluted Blake drains. To date, we have used these drains in more than 100 cardiac operations including coronary artery bypass grafting, valve repair/replacements, combined coronary artery by-

pass grafting/valve operations, heart transplants, septal defects, and mediastinal tumors.

**Results.** We have demonstrated that this form of drainage is as good as using large-bore chest tubes with no significant risk of bleeding or tamponade. Additionally, use of these tubes is less painful, allows more mobility, and earlier discharge with functioning drains in place if necessary.

**Conclusions.** Larger chest tubes are not necessarily better when it comes to draining the mediastinum. The actual area of ingress through the sideholes is considerably less than the surface area provided by the fluted Blake drain. We believe that this system can replace standard chest tubes.

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Drainage of the mediastinum and pleural space following open cardiac procedures, to prevent tamponade and pneumothorax, is normally carried out using one or more large-bore plastic tubes. The use of these large stiff tubes, however, is painful and may result in hypoventilation, atelectasis, and increased use of analgesic agents. These tubes can also impinge on the heart, particularly as the patient becomes more active, which raises concerns about initiating arrhythmias and damaging coronary grafts or adjacent structures [1].

We have recently changed our method of mediastinal drainage to the use of small, soft silastic drains that are more comfortable, provide adequate drainage, and eliminate concerns about inducing arrhythmias and damaging coronary grafts. This report reviews our experience.

## Material and Methods

At the completion of open cardiac procedures, 10 mm flat fluted silicone Blake drains (Ethicon, Inc, A Johnson & Johnson Company, Somerville, NJ) are placed and connected to a Pleurevac suction device (Fig 1). For cardiac procedures, two drains are placed through separate stab incisions near the inferior aspect of the sternotomy inci-

sion. One drain is placed inferiorly in the cardiac well, and the second drain is placed anteriorly overlying the heart. If either pleural space is opened during the procedure, a third drain is placed into the dependent portion of the pleural space. Drains are secured to the skin with silk suture and attached to Pleurevac suction using a 1/4" × 3/8" Y-connector (Gish Biomedical, Santa Ana, CA) and small adapters. Silk tape is used to reinforce the connection. Standard criteria are used for the removal of drains, which are routinely removed 24 to 48 hours following operation. However, if prolonged drainage occurs (more than 100 mL/day), the drains are attached to bulb suction to improve patient mobility. After drain removal, the site is covered with a simple gauze dressing.

Retrospective review of 102 consecutive patients with this drainage method who underwent a variety of cardiac procedures was compared with a control group of 100 consecutive patients who underwent similar procedures but had standard large-bore chest tubes for drainage. Groups were compared for rates of mediastinal bleeding and cardiac tamponade. Statistical analysis was performed using a paired *t* test.

## Results

From May 11, 1998 to May 14, 1999 this drainage system was used in 102 patients (69 men, 33 women, mean age 61.8 years) who underwent a variety of cardiac procedures. These included 65 coronary artery bypass opera-

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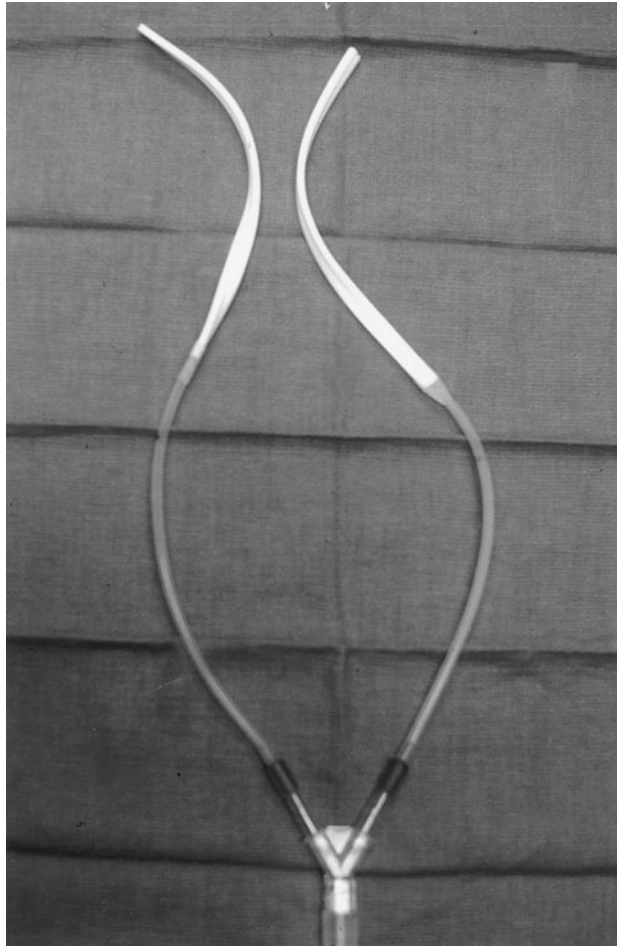


Fig 1. Mediastinal drainage system showing 10-mm flat, fluted silicone Blake drains (Ethicon, Inc, a Johnson & Johnson Company, Somerville, NJ) connected to standard Pleurevac tubing by a Y-connector.

tions (CABG), 16 valve replacement/repairs, 10 combined procedures (CABG/valve), 2 transmyocardial laser revascularizations, 2 atrial myxoma resections, 3 septal defect repairs, 2 heart transplants, 1 thymectomy, 6 redo-sternotomies, and 16 complex cardiac procedures (double valve or combined CABG/valve). Overall, there were 4 patients with mediastinal bleeding in which these drains evacuated blood at the rate of 300 to 400 mL/hour. Three of these patients required reexploration for bleeding, and one resolved after correction of coagulopathy. Three of the 4 cases of mediastinal hemorrhage also had tamponade. The same drainage system was reinserted after reexploration in 2 of the 3 patients who returned to the operating room for bleeding. There was 1 additional patient who was explored for tamponade. There were no episodes of mediastinal wound infection or sepsis related to the use of these drains. Only 1 patient developed a postoperative pneumonia and 1 patient had a late pericardial effusion 4 weeks after drain removal.

In the control group, which consisted of 100 consecutive patients (73 men, 27 women, mean age 64.7 years) who underwent similar procedures, there were 4 cases of mediastinal bleeding that required reexploration. One of these patients presented with cardiac tamponade. The incidence of mediastinal bleeding and cardiac tamponade in the experimental group was compared with controls. There was no statistical significance with regard to mediastinal bleeding or tamponade between the 2 groups.

### Comment

Mediastinal drainage is necessary following cardiac surgical procedures to prevent tamponade and, occasionally, hemo- or pneumothorax. This drainage is normally achieved using standard large-bore rigid chest tubes that remain in place for 24 to 48 hours and then are removed. The results reported herein demonstrate that small-bore soft silastic drains are equally effective for draining the mediastinum and preventing cardiac tamponade when compared with standard large-bore chest tubes.

These drains function by capillary action; blood and other tissue fluids flow in specially designed grooves on each side of the drain. A major benefit of these soft pliable drains is the decreased likelihood that they will erode into adjacent structures or disrupt anastomoses. Our results have shown that there is no increased risk of bleeding, tamponade, or infection associated with the use of smaller soft drains. In cases of prolonged mediastinal or pleural drainage, these drains can be attached to bulb suction to afford greater patient mobility.

It is difficult to evaluate scientifically the level of discomfort felt by patients, as there is no standard for comparison. However, by our own observations, these drains are much more comfortable while in place and are less painful to remove than the larger rigid tubes that have been used in the past. Two additional benefits have been noted. First, the scar at the tube insertion site is smaller and more cosmetically acceptable. Second, the use of these drains appears to permit earlier ambulation and improved pulmonary toilet. We believe this system can replace standard chest tubes for drainage of both the mediastinal and pleural spaces.

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