Postoperative Outpatient Chest Tube Management: Initial Experience with a New Portable System

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Abstract

Background: Occasionally prolonged air or fluid chest tube drainage may prevent timely chest tube removal in thoracic surgery patients who are otherwise ready for hospital discharge. We reviewed our institution's initial 20 month experience with postoperative outpatient chest tube management using a new portable chest tube device.

Methods: From May 2003 to December 2004, 457 major thoracic surgical procedures were performed at our institution. Besides excessive chest tube fluid drainage or air leak, 50 patients otherwise met criteria for discharge. After receiving general information on a small, portable chest tube system (Atrium Medical Corporation, Hudson, NH), 36 patients (mean age 55.6±15.9 years) consented to be discharged with the device. These patients received more specific written instructions and demonstrated competence on system use. Patients returned for chest tube removal after satisfactory resolution of air leak or fluid drainage.

Results: Postoperative outpatient chests tube management accounted for a total of 404 days (mean 11.2±8.1 days, range 3-36 days). There were no major complications or complications directly attributed to the device itself. Four (11%) patients experienced minor complications. Thirty-two (89%) patients experienced uneventful and successful outpatient chest tube management.

Conclusions: These data suggest that successful postoperative outpatient chest tube management can be accomplished in select patients. Not only does this program result in substantial hospital cost reduction, but also enhances patient satisfaction by allowing earlier discharge.

Introduction

Excessive fluid drainage or air leak will occasionally prevent timely hospital discharge following thoracic surgery which leads to increased length of stay associated with significant healthcare costs and potential patient dissatisfaction. Heimlich valves connected to urinary collection bags and similar devices have been previously used in these situations which allows hospital discharge with an indwelling chest tube (CT).[1-4] We recently implemented an outpatient chest tube program using a new portable and closed CT drainage system.

The Atrium Express™ Mini 500 chest tube system is a small lightweight waterless device with a 500ml collection volume.

It has an air leak detection window with a dry one-way valve equivalent to a traditional underwater seal chamber, however unlike an underwater seal chamber is not dependant on a stable horizontal position. The CT system can be attached to the body via provided straps or hook which further facilitates ambulation.

Methods

From May 2003 - December 2004, 457 major thoracic surgical procedures were performed at our institution. Besides excessive CT fluid drainage (>100 cc's/24 hours) or persistent alveolar air leak without pneumothorax on underwater seal, 50 patients otherwise met criteria for discharge. These patients were further assessed for the following criteria: ability to follow instructions and understand written information about a new, portable CT system (Express™ Mini 500, Atrium Medical, Hudson, NH), determination of outpatient location within appropriate distance to medical support, and finally patient's willingness to be discharged with a portable CT system. Patients with marginal pulmonary function, excessive pain, high volume air leaks, and/or questionable reliability to follow instructions with no home support were not offered outpatient CT management.

After this brief screening process, 36 patients (Table 1) were discharged with an outpatient CT device.

Table 1: Patient Demographics

Age		55.6 ± 15.9 (range 22-83)		
Gender	Male	28 (78%)		
	Female	8 (22%)		
Surgical Procedure*		**Fluid**	**Air**	**Total**
Pulmonary wedge		3		3
Segment/Lobe		13	5	18
Pleurodesis		2		2
Pericardial window		2		2
Mediastinal dissection		7		7
Esophagogastrectomy		4		4

*Patient numbers given per procedure with respect to type of drainage (fluid vs. air) and total patient numbers.

Four of these patients (11%) patients had undergone surgical treatment of refractory pleural or pericardial effusions, and 32 (89%) underwent pulmonary, esophageal or mediastinal resection. Twenty-eight (78%) patients either declined homecare assistance or home healthcare could not be arranged while 8 (22%) did have daily homecare visits. Prior to discharge these patients demonstrated competence on system use which included CT site dressing changes, emptying and recording daily fluid output from the collection chamber (n=31), or observation for resolution of air leak (n=5). After one patient experienced an inadvertent chest tube disconnection with an asymptomatic pneumothorax early in this program, plastic banding ties (Gish Biomedical, Santa Ana, CA) were used to secure all connections to the system before discharge which eliminated this problem.

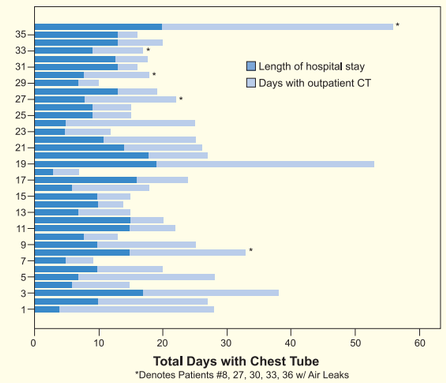
All patients received emergency contact information and were instructed to contact the thoracic surgery clinical nurse coordinator for questions and/or arrangement for CT removal when drainage <100 cc's/24 hours or air leak after forceful cough had subsided.

Results

Postoperative outpatient CT management accounted for a total of 404 days (mean 11.2 ± 8.1 days/patient; range 3-36 days). Patients discharged with alveolar air leak had a longer duration of outpatient CT management (mean 17.2 ± 11.2 days/patient; range 8-36 days) as compared to patients discharged with excessive fluid drainage (mean 10.3 ± 7.3 days/patient; range 3-34 days).

Outpatient CT management during this time period saved over $262,000 in hospital charges (number of outpatient CT days x $650/day general unit room charge). Figure 1 illustrates both the length of hospital stay (mean 10.4 ± 4.5 days/patient) and duration of outpatient CT management of all patients in this series.

Figure 1



There were no major or life-threatening complications. No patients experienced complications as a result of system malfunction. Four (11%) patients experienced minor complications. As previously noted, one patient experienced a pneumothorax requiring brief rehospitalization for application of suction to the unit after tube disconnection early in the series. One patient discharged with an alveolar air leak after lobectomy developed a localized empyema on postoperative day 17 (outpatient day 8) which was successfully treated by percutaneous drainage and intravenous antibiotics. One patient was briefly readmitted for pain control and another treated as an outpatient for cellulitis at the CT-skin site.

Although not considered a complication of the outpatient CT program per se, a patient with a prolonged alveolar air leak after pulmonary resection required pleurodesis with talc slurry through the indwelling chest tube for failure to demonstrate resolution on the 55th postoperative day (25th outpatient day). Finally, all patients in this series reported good to excellent mobility with this device and were appreciative of early hospital discharge.

Discussion

Over the past decade third party payers have pressured earlier discharge and/or increased utilization of outpatient care. This has prompted some institutions to "fast tract" patients including rapid CT removal.[5] Until more precise criteria for CT removal are established which take not only quantitative fluid or air drainage, but specific operative and patient demographic variables under consideration, we believe a conservative approach will minimize recurrent effusions or pneumothorax following premature CT removal which includes the use of a comprehensive outpatient CT program. With more aggressive surgical approaches being utilized in the treatment of solid intrathoracic malignancies, we furthermore believe that an increasing number of patients will be appropriately managed in the outpatient setting with CT drainage. These data demonstrate promising preliminary results using a novel closed CT drainage device for the outpatient management of select patients with excessive fluid or air leaks after a variety of thoracic surgical procedures. Not only does this program result in substantial hospital cost reduction, but also enhances patient satisfaction by allowing earlier discharge.

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