The Value of Routine Posttracheostomy Chest Radiography*

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**Objective:** This study proposes to evaluate the efficacy of routine posttracheostomy chest radiography.

**Design:** A retrospective chart review provided the framework of this study.

**Setting:** The study took place at a university teaching hospital-level one trauma center.

**Patients:** The study included 293 patients undergoing elective tracheostomy between 1989 and 1993.

**Measurements and results:** Data extracted from the charts included indication for tracheostomy, immediate preoperative and postoperative chest radiograph reports, management changes made secondarily to radiographic findings, including chest tube placement, institution of chest physiotherapy, and need for tracheal tube reposition. Complications were defined as findings not noted on the preoperative radiographs; these were pneumothorax, tube malposition, atelectasis, or clinical information resulting in management changes. All patients received postoperative chest radiographs in the trauma ICU. Statistical analysis of our data was carried out using the $\chi^2$ test. Patients with chest tubes in place at the time of surgery were the only group who were excluded so as not to confuse whether pneumothorax developed postoperatively. Of the initial 293 patients, 25 patients were excluded on the basis of having a chest tube. The remaining 268 charts were analyzed; 220 (82%) patients underwent tracheostomy for ventilator-dependent respiratory failure, 31 (12%) due to multiple facial fractures, 6 (2.1%) secondary to penetrating neck wounds, and 11 (4%) as a result of refractory vocal cord edema. One (0.3%) patient was found to have a postoperative 10% apical pneumothorax. Eight (2.4%) patients were found to have postoperative subsegmental atelectasis. There were no significant ($p>0.05$) management changes implemented as a result of these findings. No new infiltrates, effusions, or malpositioned tubes were noted. Deletion of routine posttracheostomy radiographs would save $52.39 per patient (cost) or $15,350 for 293 patients and $35,453 in total patient charges.

**Conclusions:** Abnormalities revealed by routine chest radiography after tracheostomy did not appear to alter patient management frequently enough to warrant the costs. A randomized, prospective study should be performed to analyze the safety of abandoning this practice.

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**Key words:** chest radiography; critical care; health care costs; managed care; resource utilization; tracheostomy; trauma

Rising concern over the expenditure of health care dollars has spawned interest in cost-saving practices in hospitals nationwide. Various diagnostic and treatment modalities, once seen as vital resources for patient care, have been proven to be overutilized and often ineffective in changing patient management. As a result, routine practices have become subject to investigation in order to determine their efficacy in patient care.

Increasing vigilance over such trends has raised questions regarding the utility of routine postproce-
**Materials and Methods**

With approval from the Institutional Review Board, a retrospective review of the charts of 293 patients undergoing elective tracheostomy between 1989 and 1993 was executed. All tracheostomies were performed with standard surgical techniques. There were no percutaneous tracheostomies performed in this group of patients. Patients with chest tubes in place at the time of surgery were excluded so as not to confuse whether or not pneumothorax developed postoperatively. This group included 25 such patients or 8.5%, leaving 268 subjects. There were no other exclusion criteria.

Data extracted from the charts included indication for tracheostomy, the immediate preoperative and postoperative chest radiograph report, and management changes made secondarily to radiographic findings, including chest tube insertion, institution of chest physiotherapy, and need for tracheal tube reposition. Complications were defined as postoperative radiographic changes that were not on the most immediate preoperative radiograph (ie, pneumothorax tube malposition atelectasis or other clinical information resulting in management changes). The initial postoperative chest radiograph was used for data extraction. Physician’s orders, progress notes, and nursing flow sheets and notes were studied in patients with complications to discern if the radiograph or physiologic changes determined whether interventions were performed. All patients received postoperative chest radiographs in the trauma ICU. Statistical analysis of the data was carried out using the $\chi^2$ test.

**Results**

Of the initial 293 patients, 25 were excluded. The remaining 268 charts were analyzed. The following patients underwent tracheostomy: 220 (82%) for ventilator-dependent respiratory failure; 31 (12%) due to multiple facial fractures, 6 (2.1%) secondary to penetrating neck wounds, and 11 (4%) as a result of refractory vocal cord edema. One (0.3%) patient was found to have a postoperative 10% apical pneumothorax. This pneumothorax was managed with observation and did not become clinically significant. Eight (2.4%) patients were found to have postoperative subsegmental atelectasis, which was not present on the preoperative film. There were no significant ($p>0.05$) management changes implemented as a result of radiographic findings. No new infiltrates, effusions, or malpositioned tubes were noted.

**Discussion**

As the growth rate of intensive care beds surpasses expansion of general hospital beds, it is estimated that critical care medicine will become one of the leading consumers of health care dollars. For this reason, as well as the raging national debate over the allocation of health care resources, questions have arisen regarding the efficacy of many of the routine practices found in the critical care setting.

Over the past few years, numerous studies have investigated the practice of routine postprocedural chest radiographs.\(^1\)\(^-\)\(^6\) Bekemeyer et al\(^1\) found that postprocedures (pulmonary artery catheterization, central venous catheterization, and thoracentesis) radiographic examination demonstrated complications related to that procedure in 5.9% of patients. Most studies note that 15 to 45% of routine morning radiographs revealed an unsuspected clinical finding when isolated to a selected group of patients (ie, pulmonary, complicated cardiac, and intubated patients).\(^2\)\(^,\)\(^7\)\(^,\)\(^8\) Gray et al\(^3\) demonstrated that reduction of routine postprocedural (central venous cordis insertion, pulmonary artery catheterization) chest radiographs through use of a protocol aimed at evaluating the characteristics of the procedure and performing a postprocedural physical examination, revealed no instance of an unanticipated, clinically significant complication. Further, numerous studies accentuate the point that life-threatening complications often are detected by clinical means long before chest radiography is performed or evaluated.\(^2\)\(^,\)\(^3\)\(^,\)\(^5\) In the light of the incidence of malpositioned tubes, several studies support the use of postendotracheal intubation chest radiography.\(^2\)\(^,\)\(^3\)\(^,\)\(^5\) This recommendation also stems from the inability of physicians to predict this complication on clinical grounds.\(^2\)\(^,\)\(^3\)\(^,\)\(^5\) Likewise, the practice of post-tube thoracostomy chest radiography is supported based on the 29% incidence of displacement of such tubes into a fissure.\(^5\)

The present study sought to investigate the efficacy of posttracheostomy chest radiography. This study is a retrospective analysis which carries with it inherent weaknesses regarding completeness of data and the inability to accurately discern what prompts the decision-making of physicians. Despite these weaknesses, this study was unable to demonstrate many complications related to tracheostomy; therefore, the results suggest several conclusions. First, abnormalities revealed by this practice did not appear to alter patient management. Therefore, one may predict that in cases in which life-threatening complications do occur (eg, tension pneumothorax), physicians can recognize and treat such problems on clinical grounds. Similarly, complications such as delayed pneumothorax and atelectasis may not reveal themselves at the time of an immediate postoperative radiograph. Such problems may not be treated until they cause clinical symptoms or are noted on a film obtained for other reasons. Second, with failure of this protocol to alter patient management, unnecessary costs are incurred. Deletion of routine posttracheostomy radiographs at our institution would save $52.39 per patient (cost) or $15,350 for...
293 patients and $35,453 in total patient charges. Third, based on the previous statements, one may conclude that routine posttracheostomy chest radiography may prove to be unwarranted. However, a randomized, prospective study should be performed to evaluate the safety of abandoning the practice of routine posttracheostomy x-ray films unless clinically warranted. Indications for the necessity of a radiograph might include respiratory or cardiac decompensation, rise in peak inspiratory pressures, or a change in clinical findings postoperatively.

**CONCLUSION**

Chest radiographs obtained following tracheostomy did not reveal abnormalities that required immediate intervention. Significant costs could possibly be saved by eliminating this diagnostic test. A randomized, prospective study should be performed to analyze the safety of aborting the practice of routine posttracheostomy chest radiographs.

**REFERENCES**