The Utility of Chest Radiography Following Percutaneous Dilational Tracheotomy

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Objective: To determine the need for routine chest radiography following percutaneous dilational tracheotomy (PDT).

Design: Retrospective chart review.

Setting: Tertiary care academic medical center.

Patients: The records of 119 patients undergoing PDT between 1993 and 2000 for indications of prolonged intubation or need for pulmonary toilet. All patients received a portable chest radiograph immediately following the procedure.

Outcome Measure: Incidence of postoperative pneumothorax or pneumomediastinum.

Results: One patient (0.8%) undergoing PDT experienced a postoperative pneumothorax. This patient was noted to have respiratory distress within 10 minutes following the procedure, suggesting a pneumothorax. A postoperative chest radiograph confirmed the clinical impression. No asymptomatic patients were diagnosed as having a pneumothorax or pneumomediastinum using postoperative chest radiography.

Conclusions: Chest radiography following PDT is indicated when there are clinical findings suggesting pneumothorax or pneumomediastinum. Without clinical signs or symptoms, routine use of postoperative chest radiographs are unnecessary and not cost-effective.


In the past 10 years percutaneous dilational tracheotomy (PDT) has gained increased acceptance as an alternative to standard open tracheotomy (ST). Several studies have demonstrated that PDT results in similar or lower postoperative complication rates compared with ST. The most commonly reported complications include bleeding, infection, accidental decannulation, tracheostomy tube placement into a false passage, pneumothorax, and pneumomediastinum. Of these complications, pneumothorax and pneumomediastinum are confirmed using chest radiography. Pneumomediastinum is typically treated with close observation and serial chest radiographs (CXR), whereas pneumothorax often requires placement of a chest tube, depending on the percentage of lung collapse and severity of symptoms. The possibility of pneumothorax or pneumomediastinum using either the PDT or ST technique has led to the standard use of CXRs postoperatively. However, the need for postoperative chest radiography has been questioned in several studies. These reports suggest that routine use of this test in the absence of clinical signs or patient symptoms does not alter the clinical management of those undergoing ST. There has been only one previous study on the utility of postoperative CXRs in patients undergoing PDT. The paucity of data on the utility of postoperative CXRs following PDT prompted us to evaluate the routine use of this test at our institution.

METHODS

The medical records of all patients undergoing PDT between 1994 and 1999 were reviewed. Patients whose medical records were incomplete and/or who had a history of head and neck cancer, airway obstruction, or a pneumothorax prior to the procedure were excluded from this study. Demographic data, primary diagnosis, hospital course, postoperative complications, and the patient’s disposition were recorded. Percutaneous dilational tracheotomies were performed by 1 of 2 attending physicians in the operating room or intensive care unit using a commercially available kit (Cook Critical Care, Bloomington, Ind). Percutaneous dilational tracheotomies performed in the intensive care unit were performed with bronchoscopic guidance, as described in previous reports. Those per...
formed in the operating room did not use bronchoscopic guidance. A portable CXR was obtained in all patients following the procedure.

**RESULTS**

Of 168 patients undergoing PDT, 119 met inclusion criteria and were evaluated. This group consisted of 60 women and 59 men, with a mean age of 60 years (range, 19-92 years). Eighteen PDTs were performed in the operating room and 101 in the intensive care unit. Diagnoses for the patients undergoing PDT were as follows:

<table>
<thead>
<tr>
<th>Diagnosis (non-head and neck cancer)</th>
<th>No. (%) of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>36 (30)</td>
</tr>
<tr>
<td>Cardiovascular (myocardial infarction, heart failure)</td>
<td>26 (22)</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease exacerbation</td>
<td>15 (13)</td>
</tr>
<tr>
<td>Neurologic</td>
<td>15 (13)</td>
</tr>
<tr>
<td>Sepsis</td>
<td>17 (14)</td>
</tr>
<tr>
<td>Other</td>
<td>10 (8)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>119 100</strong></td>
</tr>
</tbody>
</table>

There was 1 post-PDT pneumothorax in the study population. This patient demonstrated clinical signs and symptoms suggestive of a pneumothorax within 10 minutes following the procedure. These included a heart rate of 120/min, a respiratory rate of 25/min, and decreased breath sounds on the affected (left) side. A portable CXR obtained after chest tube placement confirmed the presence of a pneumothorax. There were no patients with pneumomediastinum or subclinical pneumothorax.

Tracheotomy remains one of the most common procedures performed by otolaryngologists today. Percutaneous dilational tracheotomy has been shown to be a safe and cost-effective alternative to ST in carefully selected patients. It has been routine practice at our institution to order a portable CXR immediately following PDT or ST. However, several recent studies have suggested that routine postoperative CXR is unnecessary following ST, thus questioning whether a CXR is necessary following PDT.

The incidence of pneumothorax in this study (0.8%) is within published ranges seen after ST (0%-5%) and PDT (0%-4%). The one patient in our study with a pneumothorax displayed clinical signs and symptoms suggestive of a pneumothorax within 10 minutes following the procedure. A chest tube was placed based on clinical findings only and a subsequent portable CXR confirmed the clinical diagnosis of pneumothorax. Post-PDT CXR findings did not alter the clinical management or diagnose an unsuspected pneumothorax or pneumomediastinum for any patient in this study.

One of the stated concerns about PDT has been the “learning curve” associated with this procedure. An increased risk of complications has been suggested when performed by physicians unfamiliar with PDT. Thus, the use of postoperative CXRs during this learning curve may be justified. However, from our experience, close observation for the clinical signs or symptoms of pneumothorax is as sensitive as a postoperative CXR. Indeed, a recent study by Park and Smith suggested that a careful physical examination was as sensitive as CXR in diagnosing a post-operative pneumothorax in patients undergoing ST. Our study corroborates this observation for the PDT population and extends the findings of Donaldson et al.

In the past decade the medical field has focused much attention on cost containment. Discriminate use of postoperative CXR represents one area of potential cost savings. At our institution, the cost of a stat portable CXR is $189. Although $189 represents a small fraction of the total hospital cost for performing PDT, the cumulative savings may be substantial. In fact, in the present study the potential savings by using postoperative chest radiography only in patients with clinical signs or symptoms suggestive of pneumothorax or pneumomediastinum was $22,113.

Results of our study suggest that routine use of postoperative CXRs following PDT is not necessary, as CXRs did not alter the management, nor diagnose unsuspected pneumothorax or pneumomediastinum in patients without clinical signs or symptoms of these complications. However, when there is suspicion of pneumothorax or pneumomediastinum, CXR is a useful tool for confirming the clinical impression.

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**REFERENCES**