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Chest Radiographs in Surgical Intensive Care Patients: A Valuable “Routine”

H. Mathilda Horst, MD,* Brian Fagan, MD,* and Gordon H. Beute, MD†

A total of 411 “routine” chest films were evaluated to determine their clinical value for surgical intensive care unit patients. There were 138 unexpected findings on 112 chest radiographs. These unexpected findings were equally divided between pulmonary problems (72) and device malposition (66). Of the unexpected findings, 30% were considered potentially life-threatening. On the basis of this study, we recommend “routine” chest films for monitoring in critically ill surgical intensive care patients. (Henry Ford Hosp Med J 1986:34:84-6)

Patients receiving life support in intensive care units have a rapidly changing clinical and physiologic status. Multiple methods, including invasive tubes and lines, are used to support and monitor these critically ill patients. Portable chest radiographs have been recommended as a valuable monitoring modality and are obtained routinely on patients in the intensive care units (1-3). It has been suggested that portable chest films are valuable in identifying complications resulting from the primary disease or its treatment (4).

In the surgical intensive care unit at Henry Ford Hospital, there is a standing order for daily chest films on intubated patients. Concern of this policy promoting overutilization of bedside chest films prompted us to evaluate the clinical usefulness of these “routine” portable chest radiographs.

Materials and Methods

The study population consisted of 262 consecutive patients admitted to a 15-bed surgical intensive care unit. Daily portable chest radiographs were obtained on these patients while they were intubated and at other times by physician order. The chest radiographs were interpreted with a staff radiologist and the intensive care unit team on a daily basis. Radiographic findings were compared to previous chest films and to clinical expectations. Data collection sheets were designed to include the following points: 1) indication for the chest radiograph, 2) endotracheal tube position, 3) central venous access position, 4) tube thoracostomy position, and 5) cardiopulmonary changes and/or disease. Findings were classified as unexpected if the changes were unanticipated by the clinician. All findings were recorded.

Results

During the two-month study period 411 portable chest films were obtained on 262 patients (1.6 radiographs/patient). The most common indication for obtaining a chest radiograph was a postoperative film, while the least common indication was to check line or tube placement (Table 1). The changing clinical condition of the patient was an infrequent reason for obtaining a chest film (5.6%). Only 65 chest radiographs (15.89%) showed multiple indications for obtaining the films.

There were 138 unanticipated problems recognized on a review of 133 (27%) of the 411 chest films (Table 2). These 138 problems represented 15% of the 893 abnormal radiographic findings identified in the study. The 138 unanticipated problems were almost equally divided between faulty tube or catheter position (48%) and pulmonary problems (52%) (Table 2).

A 12% incidence of malposition was discovered when monitoring the position of endotracheal and tracheostomy tubes, central venous catheters, chest tubes, and nasogastric tubes (Table 2). None of these positioning problems were anticipated. Abnormal endotracheal tube position was identified on 30 of 186 (16%) chest films on intubated patients. High placement of the endotracheal tube was seen on 12 films; the endotracheal tube was found to be placed too low on 17 films; and right main stem intubation was identified in one instance.

Malposition of central venous catheters was seen on 24 of 271 radiographs (8.8%). These positional problems included finding the catheter to be in the proximal cava (6 patients), neck (4 patients), the opposite subclavian (2 patients), and the heart or inferior vena cava (4 patients), or the catheter was kinked and coiled (8 patients). Four of 31 (13%) chest tubes were found to be inappropriately placed, with two chest tubes kinked and two chest tubes with the last hole in the subcutaneous tissue outside the pleural cavity. Esophageal positioning of nasogastric tubes was identified on eight of 77 films (Table 2).

Atelectasis of varying degrees was present on 133 radiographs. In 17 of 133 (12.8%) of these chest films, the atelectasis was an unsuspected problem. Unexpected major lobar collapse

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*Surgical Critical Care Section, Division of Trauma Surgery, Henry Ford Hospital.
†Division of Thoracic Radiology, Henry Ford Hospital.
Address correspondence to Dr Horst, Division of Trauma Surgery, Henry Ford Hospital, 2799 W Grand Blvd, Detroit, MI 48202.
was present on seven chest films (5%). Left lower lobe collapse was seen on four films, right middle lobe collapse on two films, and right lower lobe collapse on one film. Pleural effusion was an unexpected finding on 17 of 49 (35%) chest radiographs with effusion, but was minor in all instances. Clinically unsuspected an unexpected finding on 17 of 49 (35%) chest radiographs with effusion, but was minor in all instances. Clinically unsuspected pleural effusion was present on 71 chest films (5%).

Specific findings included four pneumothoraces, seven collapsed lobes, pleural effusions, and one diaphragmatic hernia. Congestive heart failure/pulmonary edema was present on 51 chest films and unsuspected in 11 cases (21.5%). Four of the five pneumothoraces seen in this series were unsuspected (Table 2). Other unexpected problems included including gastric distension, apical hematoma, subcutaneous air, sternal dehiscence, pneumomediastinum, pneumopericardium, and mediastinal hematoma.

All of the problems identified in this study required active intervention. Of the 138 unexpected problems, 44 were considered potentially life-threatening. These potentially life-threatening problems included four pneumothoraces, seven collapsed lobes, one right main stem intubation, 12 high-positioned endotracheal tubes, three pneumonias, 11 unsuspected congestive heart failure/pulmonary edemas, and one sternal dehiscence.

**Discussion**

Bedside (portable) chest radiographs are an important tool for the evaluation of critically ill patients in the intensive care units (5-8). For patients on life-support systems, frequent portable chest films are used to monitor the pulmonary parenchyma, the reported incidence of new, unanticipated, or worsening pulmonary problems documented by bedside chest films is 43% (2,3). Our study was limited to documenting unanticipated pulmonary problems, which explains the lower incidence (22%) of pulmonary problems encountered.

The impact of unexpected pulmonary problems is difficult to assess. In this study all instances required intervention. Certainly, an unrecognized pneumothorax is a potentially life-threatening situation, and the four unexpected pneumothoraces identified in our study required chest tube drainage. The seven cases of lobar collapse were potentially life-threatening and required bronchoscopy. The identified cases of congestive heart failure/pulmonary edema also required therapeutic intervention.

Device malposition is an iatrogenic problem with potentially serious consequences (4,6,10). The 12% incidence of malposition reported in this study is similar to the incidence reported in the literature (3). The position of all invasive lines and tubes should be checked by a radiograph.

In summary, this study documents that the overwhelming majority of unexpected problems are identified on "routine" portable chest films and that 27% of films obtained on surgical intensive care unit patients identified unexpected findings, some of which may be life-threatening. Based on these results, we support the use of bedside chest films as a valuable monitor.
ing routine for critically ill patients and advise the use of the "routine" films to help reduce morbidity and mortality.

References