Equal aspiration rates in gastrically and transpylorically fed critically ill patients

Abstract  Objectives: To determine the difference in aspiration rates between gastrically and transpylorically fed patients in the intensive care unit.

Design: A prospective controlled study of critically ill patients randomized to receive either a gastrically placed feeding tube or a transpylorically placed feeding tube.

Setting: University teaching hospital’s medical intensive care unit. The study was conducted over 14 months.

Patients: Fifty-four critically ill subjects (with an overall 40% mortality) with similar baseline age, severity of illness, and nutritional needs requiring enteral nutrition, with 51 completing the study.

Interventions: All feeds were tagged with technetium-99m radiolabeled sulfur colloid, and the pulmonary secretions or lungs of each patient were scanned on a daily basis to determine whether aspiration had occurred. Patients were fed according to their assigned tube placement which was verified daily by continuous electromyography.

Measurements and results: Of 27 gastrically fed patients 2 (7%) had evidence of scanned feed in pulmonary secretions or the lung, compared to 3 of 24 (13%) transpylorically fed patients (n.s.). Clinical suspicion of aspiration was insensitive and detected only 60% of isotopically documented aspirations with a positive predictive value of 27%.

Conclusion: There was no difference in aspiration rates between gastrically and transpylorically fed critically ill patients.

Key words  Enteral nutrition · Aspiration · Critical illness · Radioisotopes · Erythromycin · Metoclopramide
tion [3, 4]. The lone randomized study did not show an increase in aspiration with gastric feedings (compared to transpyloric) [5]. This study used a radiological definition of aspiration based on new dependent infiltrates on chest radiography, which is notoriously unreliable in ICU patients. The definition of aspiration has not been standardized, and clinically it is often based on imperfect tests such as patient observation, glucose testing of pulmonary secretions, or visualizing dye added to feed in pulmonary secretions [6, 7, 8]. Therefore a prospective, randomized study in the critically ill was designed, with patients being fed by either a transpyloric or a gastric feeding tube. To diagnose aspiration, enteral nutrition provided to study patients was radiolabeled with technecium-99m and scanned for in pulmonary secretions or imaged for in the lung [9, 10].

Methods and materials

The study took place in the medical MICU of the University of New Mexico Health Sciences Center, where a policy of early, aggressive enteral feeding is maintained. The study was approved by the human research review committee of the University of New Mexico. After informed consent was obtained from the subject or his or her legal representative, a 10-Fr feeding tube was placed in the randomly assigned position with the aid of an electromyographic (EMG) electrode 4 cm from the tip (Modified Flexifo, Ross Products Division, Abbott Laboratories, Columbus, Ohio, USA). Gastric position was confirmed by obtaining a typical gastric EMG (three cycles per minute, high amplitude) [11]. Transpyloric position was confirmed by finding a duodenal EMG pattern (11–13 cycles per minute, low amplitude) after having first been transited through the stomach. Abdominal radiographs were obtained to confirm tube position before beginning feeds. Erythromycin, metoclopramide, and/or fluoroscopy were used to assist the transpyloric placement of the tubes as necessary. EMG from the feeding tube was recorded continuously and verified on a daily basis to confirm the correct tube position, and the tube was repositioned as necessary.

Patients were fed with the head elevated to at least 30°, according to the protocol of the ICU. Feeding was continued, however, if there was a contraindication to the head-up position such as hemodynamic instability. All patients were fed with Perative (Ross) at a goal rate based on the Harris-Benedict equation. Feeding was started at 20 ml/h and advanced according to protocol, 20 ml every 4 h until goal rate was achieved. Residuals above 150 ml resulted in feeding being held for 4 h and then resumed according to the protocol if the residual had normalized. At the discretion of the treating physician, prokinetic agents (erythromycin or metoclopramide) could be used if the patient had elevated residuals over 24 h.

The total daily volume of feedings were tagged with 1 mCi 99mTc-labeled sulfur colloid and infused continuously. Patients received labeled food Monday through Thursday, and were scanned Tuesday through Friday. These were considered “study days.” On other days of the week patients were fed with nonlabeled feeds and not considered to be on study. Pulmonary secretions were collected at least every 8 h, and according to need. Typical reasons for suctioning were secretions in the tube, cough, oxygen desaturation. Suctioning was performed by the nurse or respiratory therapist attending to the patient, according to the practice standard in the ICU. All pulmonary secretions from intubated patients were collected into shielded, bedside, vacuum canisters, the contents of which were scanned every study day (Fig. 1). Nonpulmonary secretions were collected into a separate vacuum canister. Nonintubated patients were not suctioned routinely, nor did they have canisters, but their lung fields were imaged every study day in the nuclear medicine department. Isotopic aspiration (considered the gold standard in our study) was determined to have occurred if 99mTc tracer was detected over the lung fields or in the pulmonary secretions at a level greater than 1000 counts/ml per minute. Patients who had secretions in their canister positive on scanning were also scanned over their lungs to determine the extent of aspiration, if possible. This technique was calculated to be sensitive to as little as 0.1 ml aspirated feed per 5 ml pulmonary secretions. A Siemens 750ZLC, large field of view gamma camera (Siemens, Hoffman Estates, Ill., USA) was used for measurements. The background was determined daily in the nuclear medicine department. The volume of aspirated feed was calculated using the number of disintegrations per second of 99mTc-tagged sulfur colloid (3.7 x 1011) multiplied by 0.0625 (the amount expected to remain at 24 h). This number (2.31 x 105) was multiplied by 60 (to convert to counts per minute), and 85% of that (the counting efficiency) was determined (1.18 x 104). This number is then divided by the daily volume of feed it was mixed into giving the number of counts per ml/feed. The number of counts from the day’s suction canister contents was divided by this number to give an estimate of the amount of feed in the suctioned pulmonary secretions.

The ICU nurses documented clinical aspiration if feed refluxed into the patient’s mouth and was associated with either feed in the pulmonary secretions (assessed visually) or oxygen desaturation (at least 2% points). Patients were studied for up to 8 days, until