Pediat. Radiol. 7, 175–177 (1978)

Pediatric Radiology

Radionuclide Evaluation of a Communicating Bronchopulmonary Foregut Malformation

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Abstract. A boy with a communicating bronchopulmonary foregut malformation is presented. Since arteriography failed to demonstrate systemic or pulmonary blood supply to the lesion, ^{99M}Tc-macroaggregated albumin was injected into the aorta at the conclusion of the arteriogram. This procedure documented the existence of a systemic blood supply which at surgery arose from the ninth left intercostal artery. Administration of ^{99M}Tc-pertechnetate prior to surgery demonstrated gastric mucosa in the lesion.

Key words: Bronchopulmonary foregut malformation – Sequestration – Isotope studies

Previous descriptions of bronchopulmonary foregut malformations have documented the value of peripheral injection of a radionuclide followed by sequential dynamic images over the chest [1]. A sequestered malformation should be suspected on the basis of non-perfusion of a lung or paraesophageal lesion during the pulmonary phase of the radionuclide angiogram, followed by rapid perfusion during the early systemic phase.

This case emphasizes other lesser known potential uses of isotopes in evaluating these anomalies.

Case History

A. J. presented at age 1 year with a bilateral radioulnar synostosis. A chest x-ray taken in contemplation of possible surgical correction of the synostosis revealed a curvilinear, tubular density behind the heart (Fig. 1). An esophagram was suggested, but further medical investigation was refused at that time.

The boy returned again at age 2 with a fever. Because of persistence of the retrocardiac streak, an esophagram was performed revealing a communicating bronchopulmonary foregut malformation arising from the posterior left aspect of the distal esophagus (Fig. 2).

The malformation was believed to be responsible for the anemia, hematemesis, and numerous unexplained fevers.

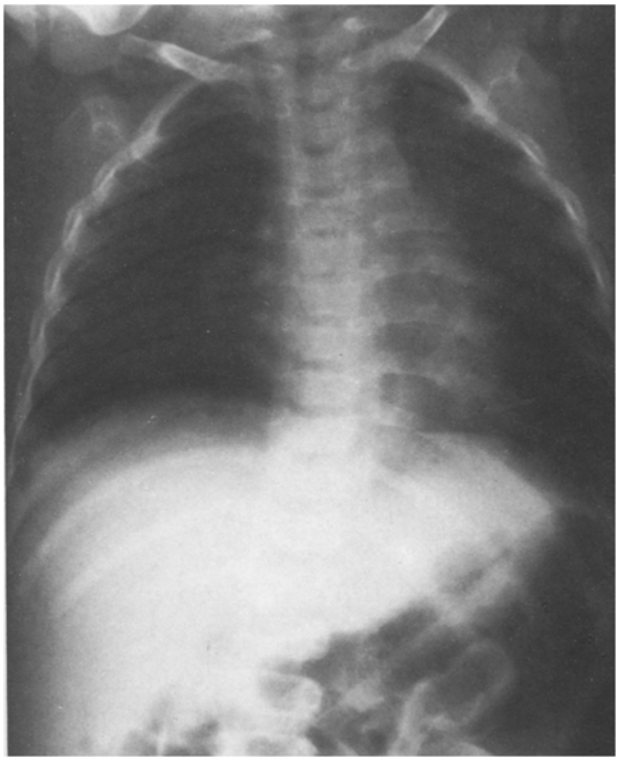

Fig. 1. There is a curvilinear, tubular density behind the heart. The medial aspect of this density is sharply defined

An angiogram was performed in anticipation of surgical removal of the lesion. However, biplane thoracic and abdominal angiography and pulmonary angiography failed to show the blood supply to the anomaly.

Because of previous reports that the blood supply to these malformations can come from unusual locations [2, 3, 5], 1 millicurie of ^{99M}Tc-macroaggregated albumin was injected into the thoracic aorta. The scan (Fig. 3) showed increased uptake overlying the distal esophagus, indicating the presence of a systemic blood supply, which at surgery arose from the ninth left intercostal.

Because of a reluctance to accept surgery, the patient's family requested evidence that the malformation contained gastric mucosa. After waiting 48 hours for the ^{99M}Tc-macroaggregated albumin to decay, the patient was given 1 millicurie of ^{99M}Tc-pertechnetate. The gamma camera scan performed with a diverging collimator (Fig. 4) showed uptake

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Fig. 2. A communicating bronchopulmonary foregut malformation arises from the left posterior aspect of the distal esophagus

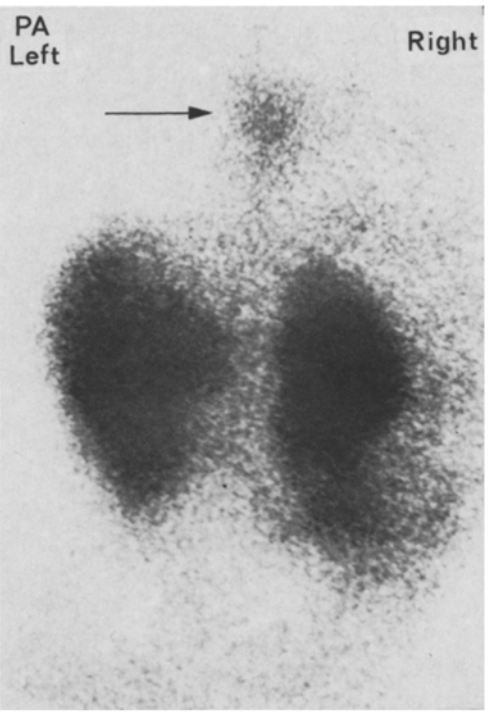

Fig. 3. Administration of 1 millicurie of ^{99M}Tc-macroaggregated albumin into the thoracic aorta demonstrates uptake in the area of the malformation, confirming the presence of a systemic arterial communication

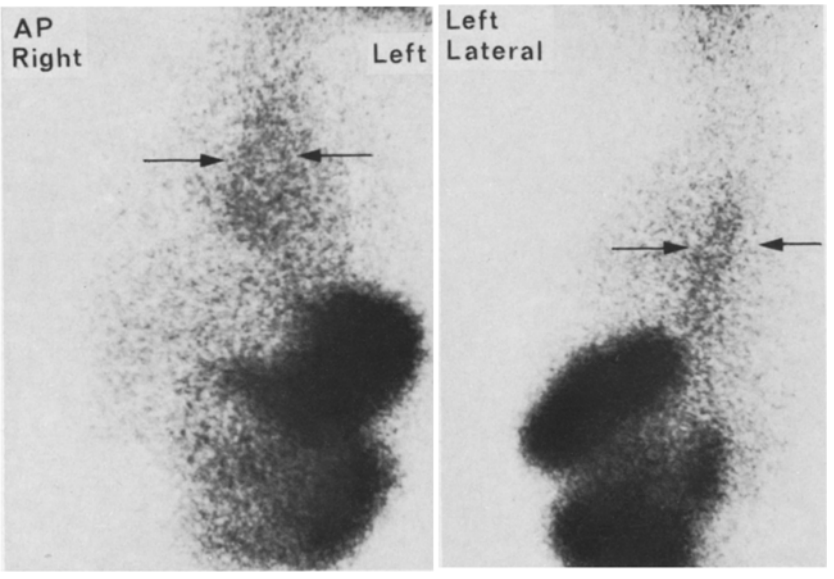

Fig. 4. Administration of 1 millicurie of ^{99M}Tc-pertechnetate demonstrates ectopic gastric mucosa in the malformation

in an area coinciding with the malformation, substantiating the presence of gastric mucosa.

At surgery, the malformation actually had two communications to the distal esophagus. The smaller communication had not been demonstrated radiographically.

Pathologically, the lesion was lined by gastric mucosa. The wall contained smooth muscle and some primitive islet pancreatic tissue. There was also evidence of recent submucosal hemorrhage.

Comment

There are several possible methods of classifying a communicating bronchopulmonary foregut malformation [2, 3, 5]. However, the understanding of this condition is greatly simplified with the realization that this anomaly is embryologically

and histologically a sequestration with a persistent pedicle of communication to the primitive foregut [3].

Depending upon the circumstances, there are several indications for radionuclide evaluation of sequestrations: (1) As in this case, systemic administration of a large particle radionuclide may indicate a systemic arterial communication not seen angiographically. (2) Administration of ^{99M}Tc-pertechnetate is a non-invasive way of establishing the congenital nature of the low paraesophageal lesion containing ectopic gastric mucosa. (3) ^{99M}Tc-pertechnetate is also useful in the primary investigation of lung lesions which are possible sequestrations since these lesions can also contain ectopic gastric tissue [1, 3]. (4) Whether the anomaly is in the lung or paraesophageal location, the demonstration of gastric mucosa is therapeutically important since it makes conservative management inadvisable and supports the need for surgical intervention.

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Date of final acceptance: November 16, 1977

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