

Diagnosis of orotracheal aspiration using radionuclide salivagram

Ali T. AKBUNAR,* Irfan KIRISTIOGLU,** Eray ALPER* and Hulya DEMIRAY*

*Departments of *Nuclear Medicine and **Pediatric Surgery, Uludag University Medical School, Bursa, Turkey*

There are two main Nuclear Medicine techniques, the gastroesophageal reflux scintigraphy with late lung imaging and the nuclear salivagram, for diagnosis of pulmonary aspiration. Each of the techniques can document the two different, antegrade and retrograde, routes of pulmonary aspiration. In this report, we presented a patient with recurrent respiratory problems and emphasized the importance of concomitant use of the two techniques in the radionuclide diagnosis of aspiration.

Key words: pulmonary aspiration, salivagram, milk scan

INTRODUCTION

THE ASPIRATION of materials such as milk, saliva, gastric contents or other foreign substances into the respiratory tract is a common cause of lung and upper respiratory disease in children. Aspiration can occur both during swallowing (antegrade) or at the time of gastroesophageal reflux (GER) (retrograde).¹ Radionuclide milk scan with late lung imaging and salivagram can be used to detect retrograde and antegrade aspiration, respectively. In this report, we present the importance of combined use of these two techniques in a child suspected of aspiration.

CASE REPORT

The patient was a three-year-old boy who had been suffering from postprandial vomiting since birth and recurrent respiratory infections. He was admitted to the hospital for protein energy malnutrition and bronchopneumonia. Having completed the routine clinical examinations and laboratory tests, the patient underwent GER scintigraphy (milk scan) with additional salivagram, barium swallow and esophageal pH monitoring.

Radionuclide salivagram was performed before GER scintigraphy. 3.7 MBq (100 μ Ci) of ^{99m}Tc-sulfur colloid

in 0.1 ml of saline was dropped under the patient's tongue. 20 sec/frame dynamic images over ten minutes and then a 2-minute static anterior image were obtained. Just after the completion of aspiration study, the patient was given about 100 ml of milk containing 37 MBq (1 mCi) of ^{99m}Tc-sulfur colloid and then 20 ml of unlabeled milk, and the GER study was immediately started. Acquisition parameters for GER study were a dynamic image sequence of 10 seconds per frame for 30 minutes and a 2-minute static thorax image at the 90th minute.

The salivagram clearly revealed saliva aspiration into the tracheo-broncheal tree (Fig. 1 top left and right). It was noticed that aspirated material was quickly cleared. Routine dynamic GER scintigraphy and the late scan, however, showed neither GER nor activity in the lung areas (Fig. 1 bottom left and right).

On barium study, a temporary stuck on the pharyngo-esophageal junction, tracheo-broncheal aspiration, and a normal esophageal passage were observed. Esophageal pH monitoring demonstrated severe GER.

DISCUSSION

Chronic aspiration can be caused by swallowing problems and/or be associated with GER, and is a common cause of pulmonary and upper respiratory complications and repeated hospital admissions. The radionuclide milk scan can be used in pediatric patients to document GER and possible aspiration. Delayed images, 2 to 4 hours after feeding, are generally obtained to search for evidence of pulmonary aspiration. Most studies, however, have shown

Received November 14, 2002, revision accepted April 28, 2003.

For reprint contact: Ali Tayyar Akbunar, M.D., Uludag Universitesi Tıp Fak., Bursa 16059, TURKEY.

E-mail: atakp@uludag.edu.tr

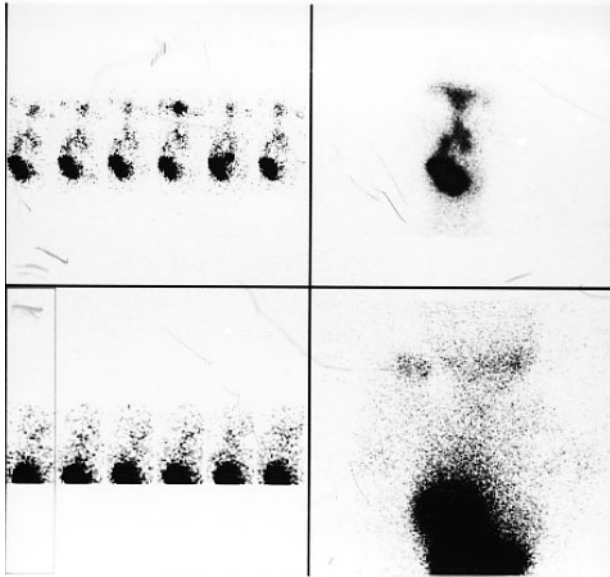


Fig. 1 Salivagram and gastroesophageal (GER) scintigraphy images. *Top left*: a series of dynamic salivagram images, *top right*: static image of salivagram study. Bilateral tracheobronchial radiopharmaceutical aspiration is clearly seen. *Bottom left*: a series of GER images, *bottom right*: late thorax scan of GER study. Neither GER nor activity in the lung areas can be seen.

a relatively low detection rate for the delayed images,² and therefore it is generally accepted that they are not sensitive enough to exclude aspiration if a negative result is obtained. Moreover, this technique generally does not demonstrate antegrade aspiration, it is not as sensitive as an upper gastrointestinal study in ruling out anatomic obstruction, and does not provide the precise quantitation of GER that a pH probe does.³ In our case, GER scintigraphy was negative both for GER, possibly because of being performed over a relatively short period of time, and aspiration.

In 1989, Heyman and Respondek reported that radionuclide salivagram was an effective tool for demonstrating aspiration of oral contents in patients thought to be at risk for aspiration.⁴ Three of their seven salivagram-positive patients also underwent milk scan, and, similar to the present case, aspiration was not detected on milk scan studies. Several other investigations dealing with radionuclide salivagram have been reported.⁵⁻⁹ They all agreed that the salivagram is a sensitive technique to detect aspiration during swallowing.

Although the presented patient was referred for milk scan to document possible GER and related (retrograde) aspiration, we combined the two techniques, salivagram and milk scan, in order to avoid missing either antegrade or retrograde aspiration. The milk scan showed neither GER nor aspiration findings in spite of the presence of

severe reflux documented later on pH monitoring and of tracheo-bronchial aspiration documented on barium study. Radionuclide salivagram, however, demonstrated tracheo-bronchial saliva aspiration, despite the short acquisition time. The combination of radionuclide salivagram and GER scintigraphy yielded valuable information in this patient with suspected GER and aspiration, in other words, scintigraphic examination would fail in documenting aspiration if salivagram study was not performed. As only a fraction of radiopharmaceutical required for GER study was used, no extra radioactivity was given to the patient. With such a combination, the whole study resembled a single three-phase aspiration-GER study.

CONCLUSION

In the present study, the salivagram study was combined with milk scan and valuable information was obtained. In patients in whom the main diagnostic clinical concern is aspiration, radionuclide salivagram should first be taken into consideration, either alone or in combination with GER scintigraphy, as in the present case.

REFERENCES

1. Collier BD. Detection of Aspiration: Scintigraphic Techniques. *Am J Med* 1997; 103: 135s-137s.
2. Ziessman HA. The Gastrointestinal Tract. In: *Nuclear Medicine: Diagnosis and Therapy*. Harbert JC, Eckelman WC, Neumann RD (eds), New York; Thieme Medical Publishers Inc., 1996: 585-648.
3. Ped CNA, Hillemeier AC. Gastroesophageal Reflux. Diagnostic and Therapeutic Approaches. *Pediatric Clinics of North America* 1996; 43 (1): 197-212.
4. Heyman S, Respondek M. Detection of Pulmonary Aspiration in Children by Radionuclide "Salivagram." *J Nucl Med* 1989; 30: 697-699.
5. Silver KH, Van Nostrand D. Scintigraphic detection of salivary aspiration: description of a new diagnostic technique and case reports. *Dysphagia* 1992; 7 (1): 45-49.
6. Levin K, Colon A, DiPalma J, Fitzpatrick S. Using the radionuclide salivagram to detect pulmonary aspiration and esophageal dysmotility. *Clin Nucl Med* 1993; 18 (2): 110-114.
7. Bar-Sever Z, Connolly LP, Treves ST. The radionuclide salivagram in children with pulmonary disease and a high risk of aspiration. *Pediatr Radiol* 1995; 25 (suppl 1): s180-s183.
8. Cook SP, Lawless S, Mandell GA, Reilly JS. The use of salivagram in the evaluation of severe and chronic aspiration. *Int J Pediatr Otorhinolaryngol* 1997; 41: 353-361.
9. Finder JD, Yellon R, Charron M. Successful management of tracheotomized patients with chronic saliva aspiration by use of constant positive airway pressure. *Pediatrics* 2001; 107 (6): 1343-1345.