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Feeding difficulties in the first days of life: findings on upper gastrointestinal series and the role of the videofluoroscopic swallowing study

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Abstract *Background.* Feeding difficulties in the newborn period are a common indication for an upper gastrointestinal (UGI) series.

Objective. To review the radiological findings in infants with feeding-related difficulties, with no other medical problems, and to evaluate the role, if any, of the videofluoroscopic swallowing study (modified barium swallow, MBSW).

Materials and methods. We retrospectively reviewed all the UGI and MBSW studies performed at our institution over a 5-year period in infants under 1 month of age. We found a total of 77 patients referred for feeding-related problems.

Results. All patients had at least one UGI study performed at our institution, and 17 patients had at least one additional MBSW. The most frequently found abnormality that could directly account for the patients' symptoms was swallowing dysfunction. This was detected in 19 patients; in 10 of these patients the swallowing dysfunction was seen only on the MBSW.

Conclusion. Swallowing dysfunction with aspiration is a common cause of feeding-related difficulties in childhood. In infants with feeding difficulties, a MBSW may demonstrate aspiration when the UGI is negative.

Introduction

In the newborn period, feeding may occasionally be accompanied by symptoms such as coughing and choking, and signs such as cyanosis and apnea. These feeding-related problems may be life threatening. Despite the fact that these feeding difficulties are frequently an indication for an upper gastrointestinal series (UGI), little has been written about the radiological findings in these patients. Our purpose in this study was to analyze the findings of the UGI series in patients with feeding difficulties in early infancy and otherwise healthy, and to review the role, if any, of the videofluoroscopic swallowing study (modified barium swallow, MBSW).

Materials and methods

We retrospectively reviewed all the UGI and MBSW studies performed at our institution over a 5-year period (1993–1998) in children under 1 month of age. For our study, we selected patients whose symptoms were exclusively related to feeding, that is, patients who were well when not eating. All patients presented with one or more of the following signs or symptoms: coughing, choking, gagging, cyanosis, apnea, respiratory distress, stridor, and bradycardia. The review yielded a total of 77 patients (37 boys, 40 girls). The patients' ages ranged from 1 to 31 days. The median age was 12 days. Of the total, 64 patients were born full term, and 13 were born prematurely between 33 and 37 weeks' gestation. Since we wanted to limit the study to a population of infants that were otherwise healthy, we excluded patients with severe congenital anomalies or known neurological deficits. All 77 patients had at least one UGI series. Only 7 patients had a second UGI, 3 of these with an esophageal tube. In addition, 17 patients had at least one MBSW. These studies in patients in the first month of life are easily performed with very little, if any, fighting or crying.

Our UGI studies are routinely performed with the patient lying down, by mouth, with a bottle with a cross cut nipple. We use a

Fig. 1a,b A 2-day-old baby girl with cyanotic and apneic spells during feeding: **a** UGI performed with an esophageal tube at another institution was reported as normal. **b** Repeated UGI with a bottle performed at our hospital at age 5 days, for persisting symptomatology, revealed severe swallowing dysfunction and aspiration. Contrast is present in both the trachea and esophagus



standard barium sulfate suspension (60% w/v, 40% w/w). We evaluate the swallowing mechanism, the anatomy of the upper gastrointestinal tract (including the duodenojejunal junction and first loops of jejunum). Special maneuvers to elicit the presence of gastroesophageal reflux (GER) are not performed. The studies are performed by a pediatric radiologist. We use digital fluoroscopy equipment, and spot films are obtained. The studies are not routinely videotaped.

MBSWs in newborns are performed by a pediatric radiologist, with the patient in a semiupright position, in a special chair, designed to fit the fluoroscopy equipment and to reduce patient mobility. The barium is diluted or thickened to different viscosities, and is given to the patient in a bottle. We use varying sized nipples. We again utilize digital fluoroscopy and the study is videotaped. The study is performed and reviewed with the assistance of a specialized speech pathologist (feeding therapist).

Results

All the patients underwent at least one UGI study. Of the patients, 39 (51%) had normal UGI series, and 38 (49%) had abnormal studies. We did not consider minimal nasopharyngeal reflux and occasional laryngeal penetration to be abnormal. We encountered the following abnormal findings (more than one finding in some patients): gastroesophageal reflux in 31 studies, swal-

lowing dysfunction and aspiration in 7, swallowing dysfunction without aspiration in 2, and an H-type tracheoesophageal fistula (TEF) in 2 patients. In 3 patients, at the request of the referring physician, we performed an additional UGI with an esophageal tube to rule out a TEF; all of these repeat studies were normal.

We performed at least one MBSW in 17 patients (22%). Of these, 14 patients had a previously normal UGI, and the decision was made to perform the videofluoroscopy based on continuing signs and symptoms. The other 3 patients had an abnormal swallowing mechanism and aspiration on the UGI, and the videofluoroscopy study was performed to further characterize the swallowing dysfunction. Of these 17 patients that underwent MBSW, 13 had an abnormal examination (76%). Nine patients had swallowing dysfunction and aspiration (6 had had a normal UGI), 4 patients had swallowing dysfunction without aspiration (all 4 had had a normal UGI), and 4 patients had normal examinations (all 4 had had normal UGIs).

Combined results of both examinations showed 48 patients (62%) with abnormal studies. These findings were (some patients with more than one finding): GER in 31, swallowing dysfunction and aspiration in 13, swallowing dysfunction without aspiration in 6, and 2 pa-

tients with an H-type TEF. We did not find significant differences in the subgroup of premature patients ($n = 13$).

Discussion

A common indication for UGI series in early infancy is difficulties related to feeding; these difficulties may potentially be life threatening. Although much has been written about feeding difficulties in children with neurological disorders [1, 2] and infants with apnea [3, 4], there has been little study of the yield and indications of radiological tests in otherwise healthy children [5–7].

In our series, the most common finding that could directly explain the feeding-related difficulties was swallowing dysfunction leading to aspiration. We considered significant swallowing dysfunction anything other than occasional nasopharyngeal reflux and minimal laryngeal penetration that may be physiologic in early infancy and may be attributable to an immature swallowing function. Our review revealed 19 patients (25%) with swallowing dysfunction that in 13 cases was accompanied by aspiration. Of these 19 patients with swallowing dysfunction 10 had a normal UGI series; thus the diagnosis of swallowing dysfunction was made in the majority of cases (53%) only by means of the MBSW. The greater sensitivity of the MBSW for the detection of swallowing dysfunction is due, at least in part, to the fact that in the MBSW there is longer and focused observation of the swallowing mechanism than in the standard UGI series. The study is performed and reviewed with a specialized speech pathologist. In addition, during the MBSW a more physiologic situation can be reproduced by altering the viscosity of the barium, thinning it with water to match the viscosity of formula or breast milk. This intervention is important

because most children with swallowing dysfunction will improve when their feedings are thickened. Thus, studies performed only with standard barium suspension, which is much thicker than formula or breast milk, may be falsely negative.

Other findings were H-type TEF and GER. H-type TEF is an uncommon occurrence. We found it in only 2 patients (3%). The fistulae were detected by routine UGI. To our knowledge no fistulae were missed. In our experience, UGI performed with a nipple and bottle allows esophageal distention that is adequate to exclude an H-type TEF. In the 3 patients with a normal UGI with a bottle, in whom a repeat study with an esophageal tube was requested, no fistulae were detected. More importantly, studies performed only with esophageal tube will not evaluate the swallowing mechanism, and, thus, a diagnosis of swallowing dysfunction, an abnormality far more common than an H-type TEF, may be missed (Fig. 1).

Finally, the most frequent finding in our series was the presence of GER of varying severity; however, in no single case could the patients' symptoms be exclusively attributed to GER. Thus the role of isolated GER in producing these symptoms remains unclear.

In summary, feeding difficulties in otherwise healthy newborns are a common clinical problem. An UGI should be the first radiological study in these patients; it will be diagnostic in patients with an H-type TEF or any other anatomical problems. The UGI may also reveal swallowing dysfunction and aspiration. However, in patients with a normal UGI and continuing symptoms, a MBSW should be performed to exclude swallowing dysfunction and aspiration as the cause of the symptoms.

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