Short reports

Vomiting and gastro-oesophageal reflux

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SUMMARY During radionuclide scans in 82 infants and children gastro-oesophageal reflux extending to the upper oesophageal/laryngeal level was detected in 636 one minute frames. Only 61 (9.6%) of these frames were associated with vomiting, defined as the appearance of milk at the mouth. Thus the absence of vomiting does not preclude appreciable gastro-oesophageal reflux.

Vomiting (or the presence of regurgitated feeds at the mouth) is recognised as the clinical hallmark of gastro-oesophageal reflux in infants. The clinician is often faced, however, with the situation where symptoms such as recurring chest infections, haematemesis, or irritability—particularly in a handicapped child—might be attributable to gastro-oesophageal reflux without clinically prominent vomiting.

We studied 82 infants using prolonged radionuclide scanning to detect gastro-oesophageal reflux and noted its frequent occurrence without clinically observed vomiting. This paper reports the relation of gastro-oesophageal reflux with vomiting in these studies.

Subjects and methods

Eighty two infants and children were studied by radionuclide scan.¹ They comprised 22 children who had had a 'near miss' for sudden infant death syndrome (SIDS); 12 siblings of previous SIDS victims; a miscellaneous group presenting with symptoms that were apparently not life threatening: choking episodes (n=29), recurrent wheeziness perhaps related to tracheobronchial aspiration (n=7), recurrent vomiting (n=8); and four children with mental retardation. The mean age was 0.36 years (0.03–1.79 years).

Gastro-oesophageal reflux was detected by radionuclide scans performed with a Siemens ZLC gamma camera and computer with a low energy all

purpose collimator (NEMA sensitivity 6.0 counts/second/ μ Ci). All the infants were fasted for at least four hours before a scan and were then fed freshly prepared ^{99m}Tc sulphur colloid mixed in a small amount of the infant's normal feed (either formula or expressed breast milk). The mean (SD) isotope dose administered to each infant was 7.76 (0.66) MBq giving an estimated reflux detection threshold in the region of 2–5 ml/second allowing adequate visualisation of episodes of reflux in the infants studied.

After the isotope/milk mixture the infant completed the remainder of his or her normal feed, was winded and then settled on the gamma camera face. Care was taken to remove any of the infant's clothing or coverings contaminated by spillage or vomiting of radioactive material during the study and if activity persisted in the nasopharynx after gastro-oesophageal reflux a small amount of non-radioactive feed was given to clear the pharynx.

The gamma camera was set to accumulate counts for 60 seconds every 60 seconds (that is, one 60 second frame was collected every 60 seconds) and the results were displayed on a monitor and stored in the gamma camera computer before subsequent transfer onto floppy disc at the end of each study to provide a long term record. The scan studies lasted on average a mean (SD) of 110 (17) minutes. Gastro-oesophageal reflux on milk scan was assessed visually during each study by one observer (JYP) who noted 'moderate' reflux (affecting only the lower oesophagus) or 'severe' reflux (extending to the upper oesophagus or larynx) during the course of the scans. A minute to minute recording of time was made simultaneously. The occurrence and time of milk appearing at the mouth (vomits) was also noted.

Results

Gastro-oesophageal reflux exceeding a threshold of 2–5 ml/second was detected in 883 frames each lasting 60 seconds. In 636 frames the reflux extended

Table Gastro-oesophageal reflux and vomiting in 'milk' scans (n=82)

	Gastro-oesophageal reflux* detection on scans		
	Severe	Moderate	Total
Frames	636†	247	883
Episodes	272	138	410

*Severe: reflux to upper oesophageal/laryngeal level; moderate: reflux into lower oesophagus only.

†Sixty one frames corresponded to 61 clinically evident vomits.

to the upper oesophageal level. The 636 frames represented 272 episodes of gastro-oesophageal reflux lasting one or more minutes.

Clinically obvious vomiting occurred on 109 occasions: at least once during the course of scanning in 43 infants. These 43 infants comprised 15 who had had a 'near miss' for SIDS, five siblings of SIDS victims, 10 who had choking episodes, four who had suspected aspiration, seven with recurrent vomiting, and two with mental retardation.

The table gives the results for gastro-oesophageal reflux and vomiting during the course of the scans. Although all vomits were accompanied by the appearance of milk at the infant's mouth, only 61 out of 109 (56%) were associated with discernible change in oesophageal activity on the gamma camera image. The remaining 48 (44%) vomits were associated with amounts of reflux that were too small to exceed the critical volume/duration threshold previously defined *in vitro*.² Conversely, of 82 scans with gastro-oesophageal reflux to the upper oesophageal level in 636 frames vomiting was only noted on 61 frames (9.5%). When data were reanalysed retrospectively the corresponding figure was 9.8%. Vomiting is a specific but not a sensitive marker of gastro-oesophageal reflux.

Discussion

These results show that gastro-oesophageal reflux, often to upper oesophageal level, often occurs without associated vomiting. When vomiting is present it is likely to represent a tip of an 'iceberg' of gastro-oesophageal reflux. Sutphen and Dillard have also noted that a history of vomiting in infants, alone or in combination with other symptoms, is not a satisfactory predictor of the amount of reflux detected in the lower oesophagus using prolonged lower oesophageal pH monitoring.³

These observations are of relevance to situations where gastrointestinal, pulmonary, or neurological symptoms might be related to gastro-oesophageal reflux but where vomiting is not a prominent

feature. The absence of vomiting does not preclude gastro-oesophageal reflux as the cause of the symptoms.

In situations where symptoms may be attributed to gastro-oesophageal reflux, but vomiting is uncommon or absent, sensitive techniques must be employed if the diagnosis is not to be overlooked. The method commonly used for detecting gastro-oesophageal reflux is the barium swallow with delayed imaging⁴ which may detect up to 85% of cases.⁵ A major limitation of radiological techniques is the necessary restriction of exposure time to minimise the radiation dose thereby increasing the likelihood of missing intermittent episodes of gastro-oesophageal reflux. The viscosity of the contrast medium can also affect the occurrence of gastro-oesophageal reflux, and for these reasons barium studies may fail to detect it and lead to misleading reassurance. In such situations, testing over more prolonged periods of time by techniques such as radionuclide scans or lower oesophageal pH monitoring may be needed if appreciable gastro-oesophageal reflux is not to be missed. Unfortunately data on the amount of reflux that would be expected on radionuclide scans on normal infants is not available. Seibert *et al* compared one hour radionuclide scans and 24 hour pH studies and found that only one episode of reflux was necessary on a one hour radionuclide study for a subsequent 24 hour lower oesophageal pH study to be positive.⁶ By this criterion it seems likely that many of the infants we studied had appreciable gastro-oesophageal reflux.

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