repair; *(ii)* it is our impression that of the babies in whom gastrostomy and esophagostomy has been done, few come back later for esophageal reconstruction, the remaining probably die in the waiting period due to various causes; *(iii)* esophageal substitution is a poor alternative and all attempts must be made to preserve the esophagus.

It was observed that the attitudes of residents and nursing staff contributed to the success in some of our cases. Since a majority of the staff had not seen a baby survive during their training period earlier, they all had a fatalistic approach towards these babies. However, when they did see the one that survived, their attitude changed and they looked after these babies with more enthusiasm and aggression.

REFERENCES

1. Beasley SW, Myers NA. Trends in mortality in esophageal atresia. Pediatr Surg Int 1992, 7: 86-89.
2. Mitra DK. Results of treatment of tracheo-esophageal fistula at AIIMS, New Delhi. Paper presented at the Annual Conference of the Indian Association of Pediatric Surgeons, Calicut, 1991.
3. Mitra SK. Results of treatment of tracheo-esophageal fistula at PGI, Chandigarh. Paper presented at the Annual Conference of the Indian Association of Pediatric Surgeons, Calicut, 1991.
4. Sharma AK. Results of treatment of tracheo-esophageal fistula at Jaipur. Paper presented at the Annual Conference of the Indian Association of Pediatric Surgeons, Calicut, 1991.

Total Thoracic Stomach

S.K. Puri
B. Soan
M. Goyal
R. Kulshreshtha
V. Baijal
M.M. Saha

Large hiatus hernias are quite uncommon in children. "Total thoracic stomach", an extreme form in which the entire stomach herniates into the thorax is a very rare entity and few cases have previously been reported(l,2). Paradoxically, most of these patients present with minor symptoms attributable to gastro-esophageal reflux or recurrent chest infections(l). The diagnosis in such cases can frequently be made on chest X-ray although barium studies are confirmatory. The outcome of surgery is usually good, unless there is associated stricture of the esophagus and/or short esophagus(l,2).

We report two cases of "total thoracic stomach" which were associated with non-

From the Department of Radiodiagnosis, LNJPN Hospital, New Delhi and the Departments of Radiodiagnosis and Pediatric Surgery, Safdarjang Hospital, New Delhi 110 029.

Reprint requests: Dr. Sunil Kumar Puri, Associate Professor, Department of Radiodiagnosis, G.B. Pant Hospital, New Delhi 110 002.

Received for publication: September 23, 1993; Accepted: September 30, 1993

specific symptoms and characteristic radiological features.

Case Reports

Case 1: A 5-year-old male child presented with non-specific complaints of anorexia and failure to thrive. There was also history of recurrent chest infections. Clinical examination was unremarkable except that the child was anemic and malnourished.

Hemoglobin was 8 g/dl while other routine blood and urine investigations were normal. PA *(Fig. la)* and lateral X-ray of the chest showed bilaterial, round, retrocardiac opacities with an air-fluid level on the left side. The fundal gas bubble was not seen below the left diaphragm. Barium meal examination *(Fig. lb)* of upper gastro-intestinal tract showed the entire stomach to be intrathoracic with the gastro-esophageal junction above the diaphgram and towards the left of midline. There was no stricture in the lower end of the esophagus while free gastro-esophageal reflux was been. The stomach had undergone 180 degrees anterior organo-axial torsion with the points of rotation being the body of stomach and distal antrum at the hiatus. The first part of duodenum was also stretched and appeared to be entering the abdomen from right towards left. There was no obstruction at the pylorus.

The patient was explored through a left subcostal incision. The esophageal hiatus was patulous (approximately four fingers width) and the stomach could be easily pulled down into the abdomen. Repair of the hiatus with Nissen's fundoplication was done. The post-operative period was uneventful with no recurrence of hernia.

Case 2: A one-year-old male child

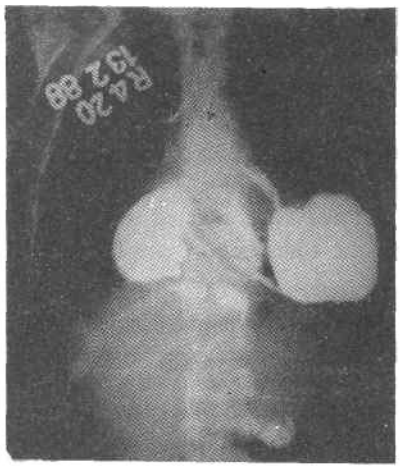

Fig. 1a. X-ray chest PA: Large, well-defined, bilateral retrocardiac opacities with an air-fluid level on left side and absent fundal gas bubble below left diaphragm.

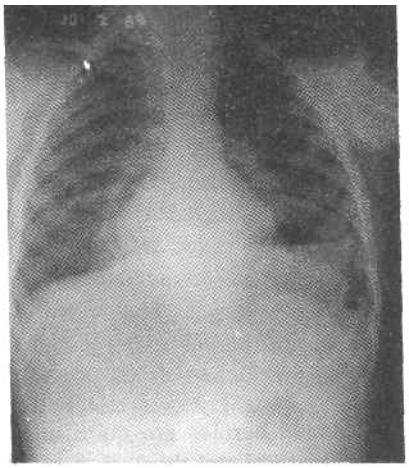

Fig. 1b. Barium meal UGIT: Herniation of entire stomach into the thorax, with normal lower end esophagus and 180 degrees organo-axial torsion of the body and antrum.

presented with complaints of vomiting off and on since birth. The clinical examination was unfruitful. Routine blood investigations were normal. Frontal and lateral radiographs of the chest showed bilateral lucent shadows with well defined margins. While the shadow on the left was entirely retrocardiac, the one on the right was larger and extended more laterally. The fundal air bubble was not seen below the left diaphragm. Barium meal examination *(Fig. 2a)* showed total thoracic stomach with the gastro-esophageal junction above the diaphgram and towards left of the midline. There was hold up of barium and mild dilatation of the esophagus proximal to a smooth narrowing of its lower end. Free GE reflux was seen. The body and antrum of the stomach had undergone 180 degree organo-axial torsion. There was no obstruction at the pylorus.

A pre-operative diagnosis of sliding hiatus hernia with total thoracic stomach and stricture at the lower end of esophagus was tendered, and the patient was explored through an upper midline incision. The whole of the stomach had migrated into the chest through a very large esophageal hiatus (approximately 10 cm by 8 cm). The phrenico-esophageal fold was incised and the stomach brought down into the peritoneal cavity. The esophagus was of normal length and no stricture could be palpated at its lower end. The eso-

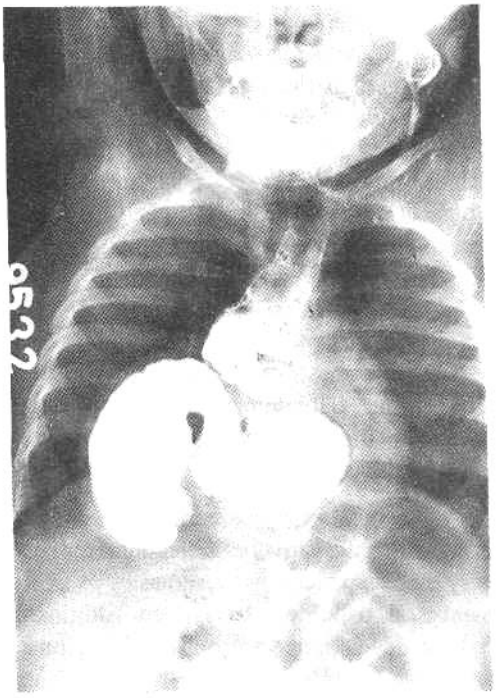

Fig. 2a. Barium meal UGIT: Total thoracic stomach, with 180 degrees organo-axial torsion of body and antrum. Narrowing at lower end of esophagus due to spasm.

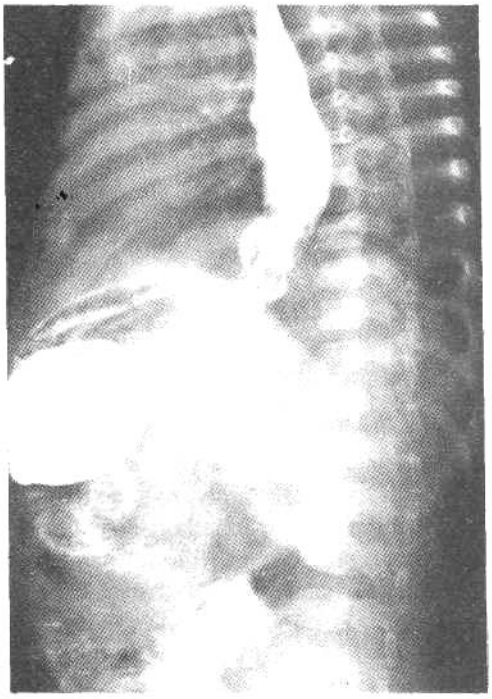

Fig. 2b. Post-operative barium meal: Normal lower end esophagus with stomach in abdominal cavity.

phageal hiatus was repaired and Nissen's fundoplication was done.

The post-operative barium study *(Fig. 2b)* demonstrated the stomach to be in its normal position and there was no stricture at the lower end of esophagus. The narrowing seen in the pre-operative study was attributed to reflux esophagitis and spasm.

Discussion

Hiatus hernias are uncommon in children and constitute only 5 to 10 % of all diaphragmatic defects(4). Considerable controversy exists regarding the etiology of hiatus hernia particularly of the sliding type. However, most authors concur that it is an abnormal hiatus rather than a congenital short esophagus which leads to herniation of the stomach into the chest. The short esophagus which is frequently seen in these patients is a sequelae of reflux esophagitis leading to cicatrization and shortening(5,6). We found only a solitary case of true congenital short esophagus in the literature(7).

Most patients with a large or total herniation of the stomach even of many years duration, have minor symptoms like substernal and epigastric burning, feeling of fullness after eating, vomiting and recurrent chest infections. Hematemesis occurs in 20 to 90% of cases(2). Rarely, obstruction and strangulation of an fntrathoracic stomach may occur and can be life-threatening if not relieved immediately(3). An increased incidence of migraine, pyloric stenosis and mental retardation has also been reported(8).

Intrathoracic stomach can undergo different type of torsions due to its various ligamentous attachments and fixed points(3). The most common is 180 degree anterior organo-axial torsion resulting in an upside-down stomach in which the greater curvature lies above the lesser curvature. Posterior organo-axial torsion and mesentero-axial torison are rare. Rarely, other organs like duodenum, transverse colon, omentum and the left lobe of the liver can also accompany the heraiating stomach into the thorax.

Plain films of the chest show bizarre, large, retrocardiac, rounded shadows which may extend for a variable distance above both the domes of the diaphragm. These shadows may be radio-opaque or lucent and may show air-fluid levels depending upon the position of the patient and the amount of gas in the stomach at the time of examination. Absent fundal air bubble below the left diaphragm is an important diagnostic clue. Although the diagnosis can often be made on plain X-rays of the chest, barium studies are still mandatory in order to demonstrate the exact position of the stomach and gastro-esophageal junction and to exclude any structural abnormalities of the esophagus or stomach (short esophagus, stricture esophagus or pyloric stenosis). Computerised tomography has a cote in demostrating the exact site and size of the diaphragmatic defect and the presence of any unattached herniated peritoneal sac.

While smaller hiatus hernias are usually managed conservatively, indications for surgery include patients not responding to treatment and therefore, having an additional risk of developing an esophageal stricture, and large hiatus hernias(2). In the patients with no esophageal stricture, a simple hiatus repair is done while in those with an associated stricture, either repair with retrograde dilatation or stricture excision with or without jejunal inter-position is necessary. Al-

though the overall response to surgery is good, structural changes in the esophagus adversely affect the recurrence rate and morbidity and are more significant prognostic indicators than the size of the hiatus hernia(l,2).

We summarise that hiatus hernia leading to "total thoracic stomach" is a rare occurrence in childhood. In view of the non-specific symptoms associated with this condition, its awareness is essential for early diagnosis, especially since surgery can be curative. Plain chest radiography and barium studies are usually adequate for diagnosis. In both our cases, the stomach was successfully brought down into the abdomen with no post-operative recurrence.

REFERENCES

1. Danema NA, Kozlowski K. Large hiatus hernia in infancy and childhood. Australas Radiol 1977, 21: 133-139.
2. Harp RA, Gonzalez JL, Graham I. Total gastric hiatal herniation in an infant. J Pediatr Surg 1965, 57: 302-304.
3. Humphereys GH, Wiedel PD, Baker DH, Bcrdon WE. Esophageal HH in infancy and childhood. Pediatrics 1965, 36: 351-358.
4. Gerson DE, Lewicki AM. Intrathoracic stomach: when does it obstruct? Radiology 1976, 119: 257-264.
5. Kiesewetter WB, Gurierreg 1Z, Sieber WK. Diaphragmatic hernia in infants under one year of age. AMA Arch Surg 1961, 83: 561-563.
6. Olsen AM, Holman CB, Harris LE. HH in children: Special reference to the short esophagus. Dis Chest 1960, 5: 495-506.
7. Peters PM. The congenital short esophagus. Thorax 1958, 13: 1-4.
8. Waterston D. Pediatric Surgery, Vol. II Chicago, Year Book Medical Publishers, 1969.