Operation for gastro-oesophageal reflux associated with severe mental retardation

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Abstract
One hundred and seventy six children with severe mental retardation underwent a fundoplication for considerable gastro-oesophageal reflux. There were six 'early' (3%) deaths and five 'late' deaths. Major complications developed in 17 (10%) children whereas 86 (49%) had 'minor' complications. A revision operation was required in 27 patients. Overall 142 (81%) children achieved a good result.

In spite of the high complication rate and the need for a secondary operation in 15% of the patients, the quality of life for these children and their parents and carers is greatly improved by antireflux surgery.

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The association between gastro-oesophageal reflux and cerebral palsy was first reported by Abrahams and Burkitt in 1970.1 Previously, Neuhauser and Berenberg in 1947 and Gross in 19532 had noted that infants with severe mental retardation generally responded poorly to conservative treatment. Even Carre (1985),3 a protagonist of conservative treatment of hiatal hernia, recognised that a higher proportion of mentally handicapped children with gastro-oesophageal reflux required surgical treatment due to 'delay in diagnosis and the difficulty in carrying out postural therapy in this group of patients'. Vomiting, failure to thrive, recurrent respiratory infections, and periods of irritability and pain are widely accepted as being part of the disability of severe mental retardation. If fully investigated, a significant proportion of these children will be found to have gastro-oesophageal reflux.4 The high failure rate of medical measures in this special category of patients justifies an aggressive surgical approach, but only after the medical treatment has been given a fair trial.

The aims of this study were (a) to analyse the results of the surgical treatment of gastro-oesophageal reflux in children with severe mental impairment, (b) to document the complications of the procedure, and (c) to assess the effect of the operation on their quality of life.

Patients and methods
A total of 495 Nissen fundoplications were performed at the Hospital for Sick Children, Great Ormond Street, London in the period 1980–90. More than one third of these patients had severe mental retardation, the case notes of 176 of whom were available for retrospective analysis. Children with mild retardation (developmental delay, absent corpus callosum, hyperactivity) were excluded from the study. There was a male preponderance of 110 boys to 66 girls, reflecting the higher frequency of chromosomal abnormalities and syndromes in boys.

Table 1 gives the aetiology of the cerebral dysfunction. Major associated anomalies were recognised in 62 (35%) patients, being more common in those with a chromosomal abnormality (53%) or a recognised syndrome (65%). Before the fundoplication 67 (38%) had undergone an operation for the correction of another malformation such as diaphragmatic hernia (two), oesophageal atresia (five), cardiac malformation (11), or airway procedures (10).

SYMPTOMATOLOGY
Symptoms of gastro-oesophageal reflux were noted soon after birth in 45% of the patients, etc.
especially in 70% of infants affected by a named syndrome (table 2). Overall, two thirds of the patients developed symptoms during the first year of life. Children with epilepsy or acquired cerebral damage presented with symptoms after the second year of life (mean age 8·2 years). The most common and significant symptom was vomiting (92%), followed by failure to thrive (84%), swallowing difficulties (64%), and recurrent respiratory infections (48%). The presence of ‘coffee grounds’ or fresh blood in the vomitus was noted at some time in 20% of patients. Vomiting generally tended to occur after feeds but in some children it was almost continuous. The combination of malodorous clothing with soiled carpets and furniture isolated many families and profoundly affected the social development of siblings. Failure to gain weight and to thrive was often considered to be a primary feature of the underlying mental handicap/disorder rather than being attributed to the associated gastro-oesophageal reflux. The vomiting made it impossible to estimate the amount of drugs absorbed, and often led to poor control of convulsions and other medical disorders. Swallowing problems, due to cricopharyngeal incoordination or dysphagia secondary to reflux oesophagitis or strictures, or both, were present in 64% of patients. The inability to swallow was the main symptom in eight of 11 children with CHARGE association and 2 of the four with Riley-Day dysautonomia. Recurrent respiratory infections, which occurred in 48% of children, had been ascribed to chest deformities resulting from scoliosis and to general lack of mobility rather than to recurrent, often occult, aspiration episodes.

Owing to the inability of these children to communicate, the true incidence of pain secondary to reflux was difficult to determine. The parents of 50 (28%) children were convinced that pain was a considerable problem. Two children had severe bouts of pain and screaming accompanied at night by small vomits, which often contained ‘coffee ground’ material. Severe iron deficiency anaemia due to chronic blood loss from ulcerative oesophagitis was present in five children, and some degree of anaemia was documented in 16% of patients.

INVESTIGATIONS
The barium meal examination did not show gastro-oesophageal reflux in 36 (20%) patients. The reflux was classified as grade III, affecting the full length of the oesophagus, in 87 (65%) of the remaining 134 patients. A hiatus hernia was present in 90 (51%) patients.

Pharyngo-oesophageal incoordination with tracheobronchial aspiration was a common occurrence in children with a defined syndrome. In 13 (7%) children a midgut malrotation was diagnosed on the barium follow through examination.

pH studies were performed in only 63 patients but were pathological in 57 (90%) with a pH less than 4 for more than 5% of the total recorded time. Upper gastrointestinal endoscopy was performed in 150 children. There was no evidence of oesophagitis on endoscopy in 54 (36%) patients whereas 45 (30%) had advanced oesophageal mucosal damage in the form of ulcerative oesophagitis or established stricture formation. Endoscopic biopsy samples were taken in 32 patients, 17 of whom showed inflammatory changes on histopathological examination.

Only one patient was diagnosed as having Barrett’s oesophagitis. Oesophageal manometric studies in 12 of the children with severe oesophagitis showed considerable neuropathic activity with lower oesophageal sphincter pressures (1·87 (0·93) vs controls 2·93 (0·53) kPa) and slow acid clearance (4·5 (0·9) vs controls 0·7 (0·1) minutes).

TREATMENT
All patients had received drugs for gastro-oesophageal reflux before referral but a further intensive trial of medical treatment was undertaken in 130 (74%) children. This consisted of thickening of feeds and upright positioning, whenever possible, combined with one or more of the following drugs: alginates and antacids (usually Gaviscon), prokinetic drugs (metoclopramide, domperidone, cisapride), or H2 blockers (cimetidine, ranitidine). The duration of the conservative trial was at least one month but more often several months before proceeding to an operation.

Despite the early onset of symptoms, operations were performed on only four infants (two each with Opitz G and CHARGE association) within the first month of life and a further 36 infants during the first year (fig 1). The mean age at operation was 4·25 years, being earlier in the chromosomal (2·5 years) and syndrome groups (3 years), and later in the epilepsy group (7·5 years). Symptoms had been present for more
than one year in 104 (59%) children before the operation.

A Nissen fundoplication was carried out in 172 patients as a primary procedure and in four as a secondary procedure after the failure of anti-reflux surgery performed elsewhere. The operative procedure consisted of a short, floppy fundoplication using two layers of non-absorbable sutures. The hiatal crura were repaired in 93% of patients. Eight patients had a pyloroplasty and five a pyloromyotomy for delayed gastric emptying as assessed on the barium follow through study. In six children duodenal bands were divided and in 20 a Ladd’s procedure carried out for associated midgut malrotation, of which 13 were diagnosed on the barium meal examination and seven at laparotomy. Ten of the children with malrotation occurred among the 42 with a recognised syndrome whereas the remainder were equally distributed among the other groups. A Stamm gastrostomy was performed in 38% of patients and is currently routinely performed in all children with a swallowing problem. Mouth or gastrostomy feeds were begun on the third to fifth day after the operation and the children were generally discharged on the seventh to tenth day after the operation. Children with recurrent respiratory infections had intensive physiotherapy before and after the operation and all received prophylactic perioperative antibiotics.

### Results

There were six early deaths (3%) — that is, within six weeks of the operation. Three of the deaths occurred as a consequence of cardiorespiratory problems in the first 24 hours after the operation, whereas the remaining three deaths were due to the primary disorder and unrelated to the operation.

Major complications were encountered in 17 (10%) patients (table 3). One child with a complex cardiac malformation had an intra-operative cardiac arrest but was successfully resuscitated. Twelve (7%) patients developed adhesive intestinal obstruction which required operative lysis. Two children with intraperitoneal catheters (ventriculoperitoneal shunt, Tenkoff catheter) developed sepsis necessitating the establishment of alternative drainage sites. The gastrostomy tube was misplaced into the peritoneal cavity after early replacement for blockage in one child and revision of the gastrostomy was necessary in a further two.

Of the minor complications (table 3), gasbloat was the most common, developing in 46 (26%) of patients. It was mild and transient in 21, but persisted for several months in 22 and was a significant problem lasting for more than one year in three children. Retching lasting for several months occurred in 31 patients and continued to be a problem for a year or more in five. Diarrhoea and dumping usually responded promptly to medical treatment and dietary manipulation. Overgrowth of granulation tissue at the gastrostomy site was problematic in 15 (9%) children but responded rapidly to the local application of a steroid/antibiotic ointment (Sofradex). Respiratory infections developed despite intensive physiotherapy in 14 (8%) patients and was more a reflection of the debilitated state of the children than a complication after the operation.

### Follow Up

Excluding the six early deaths and seven patients lost to follow up, 163 patients were available for evaluation (fig 2). The mean follow up period was 2.5 years. A good result was achieved in 123 (70%) patients who experienced no feeding problems (by mouth or via gastrostomy), achieved satisfactory weight gain, and had a considerable improvement in their presenting symptoms. In addition, a further 19 patients responded well but only after a secondary operation; 17 required revision of the fundoplication and one each required a gastrostomy and pyloroplasty. Overall 142 (86%) of the 163 survivors had a highly satisfactory outcome.

The primary outcome was unsatisfactory in 40 children. There were a further five deaths in this
group, three in children with spastic diplegia and epilepsy and two with CHARGE syndrome. All had developed recurrent symptoms of reflux three months to one year after the operation. Two of these had recently undergone a revisionary operation.

Two of five (14%) patients had to have a repeat operation on the fundoplication for recurrent symptoms such as vomiting (15), swallowing problems (six), aspiration episodes (six), pain (four), retching (three) and gasbloat (three). The revision procedure was carried out between two months and seven years (mean 1.75 years) after the operation. At operation the most common finding was prolapse of the wrap into the posterior mediastinum through an enlarged hiatus (19) with or without an associated paraoesophageal hernia (16). In two patients the wrap was too tight and in only two instances had the wrap partially disrupted leading to recurrent reflux. The outcome after the revision operation was good in 17 (68%) children.

Discussion

Recurrent vomiting occurs in 10–15% of mentally retarded children.14 The vomiting is often regarded as part of the neurological problem. If fully investigated up to 75% of these children can be shown to have gastro-oesophageal reflux with or without associated hiatal hernia.15

A number of factors contribute to the increased incidence of reflux among retarded children. The lower oesophageal sphincter pressure is considerably reduced, especially in the presence of severe oesophagitis, compared with normal subjects.10 The level of reduction in lower oesophageal sphincter pressure has been used to predict the need for an operation.16 None of the patients with pressures less than 10 mm Hg in the series of Sundheimer and Morris responded to medical treatment. In addition, dysmotility of the oesophagus, shown by reduced acid clearance, predisposes to mucosal damage.17 The intra-abdominal pressure is often increased in severely retarded patients due to spasticity of the abdominal musculature, scoliosis, and recurrent seizures. Many of these patients spend long periods in the supine position so that postural treatment for the reflux is impractical. It is thus evident that a number of factors combine to increase the propensity of the severely retarded child to develop symptomatic gastro-oesophageal reflux.

The clinical features of gastro-oesophageal reflux in retarded children are similar to those in normal subjects. Vomiting, which occurs in over 90% of patients, varies from an effortless retching after a meal to continual small regurgitations throughout the day. The presence of ‘coffee grounds’ in the vomitus is an indication of ulcerative oesophagitis. Respiratory complications are common and may be due either to incoordination of the swallowing mechanism or to aspiration of refluxed gastric content. As a result of recurrent vomiting, poor swallowing, and delayed referral, 80% of patients are severely malnourished by the time the diagnosis is established. At least 25% of parents report that their children appear to be in pain and are excessively irritable. The irritability may be due to the burning pain of peptic oesophagitis or to hunger from inadequate nutritional intake. The response to an effective antireflux operation in these children is often dramatic – they rapidly become calmer and more responsive.

Investigations of vomiting in the neurologically impaired child include an upper gastrointestinal barium meal study in which the degree of reflux, particularly aspiration of contrast, is recorded as well as the presence of an anatomical hiatus hernia, oesophagitis, oesophageal stricture, dysmotility, and gastric drainage. Oesophageal pH monitoring, the gold standard measure of reflux, is difficult to perform in this group of patients as they do not tolerate the probe being in situ for prolonged periods and tend to remove it at the least provocation. Routine endoscopy is important to document the degree of oesophageal damage. Many of the patients have respiratory insufficiency as a consequence of recurrent aspiration pneumonia. In these patients it is important to perform lung function studies before the operation and to carry out prophylactic physiotherapy and administer antibiotics to improve lung function.

The 176 patients in this series constituted a highly selected group referred to a tertiary referral centre for further evaluation and management. They had all received some medical treatment before referral and a further intensive trial of conservative management was undertaken in 130 (74%) of these children. The decision to proceed to an antireflux operation was based on (a) the severity of the symptoms – for example, haematemesis, malnutrition, recurrent respiratory complications, (b) the effect of the recurrent vomiting on the well being of the child and the social effect on the family, and (c) the demonstration of oesophageal complications – for example, ulcerative oesophagitis, stricture formation, large hiatal hernia.

The operation consists of a standard 360° Nissen fundoplication. It is important that the wrap is ‘flappy’ and short (1.5–3 cm) over the distal oesophagus. The upper short gastric vessels are divided to achieve a loose wrap. The crura are approximated posterior to the oesophagus with a few non-absorbable sutures. A Stamm gastrostomy is performed in a convenient part of the stomach and the tube brought out through a

<p>| Table 4 Incidence of complications from the large series published previously |</p>
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<th>Authors</th>
<th>Year</th>
<th>Reference No</th>
<th>No of patients with central nervous system impairment</th>
<th>Complication rate (%)</th>
<th>Intestinal obstruction (%)</th>
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1985 Reference

1988 Reference
Operation for gastro-oesophageal reflux associated with severe mental retardation