The haemoglobin figures in the main series have been subjected to two analyses. The first shows that the responses to therapy of all the patients can be expressed by a common curve without regard to the degree of the initial anaemia. The existence of this curve establishes the importance of continuing iron therapy for as long a time in mild anaemia as in severe cases and demonstrates that this should be for more than two months.

The second analysis is based on the establishment of this common curve. The mean percentage recovery attained by the end of the third week was 59%, with a statistical accuracy for the mean of ± 4.8 . It is suggested that this method of analysis and presentation of data with known statistical accuracy will allow of comparisons between trials of different iron preparations. The haemoglobin levels at the start of therapy, after three weeks, and on reaching normal are required for this method of analysis.

The willingness with which patients were referred for treatment by the consultants of the hospitals concerned, by their staffs, and by family doctors, is gratefully acknowledged. Dr. E. K. Blackburn, in whose department the work has been carried out, has been particularly helpful at all stages. Dr. I. McLean Baird kindly performed the radio-iron study in one case. Thanks are also due to Mr. J. Monaghan and Miss Joan Ripley for technical help; to Mr. A. Howard; to the Board of Governors of the United Sheffield Hospitals for a research grant; and to Mrs. W. M. Wright and Miss D. Kirk for computational assistance. Glaxo Laboratories Ltd. kindly supplied tablets for the trial and have assisted in other ways.

Statistical Appendix

Analysis 1

Lines of regression of haemoglobin at the week (k) on initial haemoglobin were fitted for k=1 to 8 inclusive and for the two categories of patient (simple and complicated iron deficiency) and the standard errors of their coefficients were estimated. Differences between slope and differences between positions of the lines for the two categories of patient were compared with their standard errors, and in no case proved statistically significant at the 5% level, therefore a single regression was computed for each week, the categories being combined. The regressions for the different weeks were of course subject to sampling errors, which were largest for k=5 and 7, for which only a few records were available.

The method of analysis first adopted was to fit curves of suitable exponential type to the slopes of the regression lines; and to their heights at 59.

Curves were fitted by weighted least squares (weights being inversely proportional to sampling variances) and provided approximate χ^2 criteria of goodness of fit of 2.27 and 11.69 respectively, each with six degrees of freedom. The failure of these to attain the 5% level of significance, along with the apparent lack of trend in the deviations from the fitted curves, confirmed the adequacy of these curves as a summary of the data, and curves of the form shown in Fig. 2 were deduced from them. However, it was noted that when these were re-scaled, as in Fig. 3, they became almost identical, and it was therefore decided to fit curves to slope and height which were related in such a way as to give a single curve as shown in Fig. 3. This was done by an approximation to least squares. The corresponding joint χ^2 criterion was 9.83, with 13 degrees of freedom, indicating a fit which was not only satisfactory but better than before. This seems paradoxical until it is remembered that the new curve fitted to heights comes from a more complicated mathematical family than appeared to be necessary for the first analysis, and is thus more flexible.

Evidently there are adequate grounds for summarizing the data by the curve of Fig. 3.

Analysis 2

The three observations required for computing p were available in 27 cases. In 26 of the remainder, either x_3 or x_8 was not available, and the following expedients were adopted as necessary: (1) x_3 interpolated between observed values—for example, $\frac{1}{2}(x_2 + x_4)$, or $\frac{2}{3}x_2 + \frac{1}{3}x_5$ —a procedure justified by the approximate straightness of the curves of Fig. 2 over the range one to six weeks. (2) x_7 used in place of x_8 , with a slight adjustment, using the appropriate curve of Fig. 2. (3) x_8 estimated entirely from the appropriate curve of Fig. 2.

In two cases the data were insufficient for the application of these expedients, and were therefore not used.

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PARTIAL THORACIC STOMACH IN CHILDHOOD

BY

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The condition known as congenital short oesophagus, hiatus hernia, or partial thoracic stomach has interested paediatricians and surgeons only comparatively recently. It is clear from the work of Carré *et al.* (1952) that the course is generally benign, symptoms subsiding after the first year or two of life in the majority of children, though it seems probable that they may recur in adult life. Unfortunately, not all cases pursue this favourable course, and vomiting may continue intermittently for years. Stricture formation is the main complication to be feared, but as yet there is no evidence to show that prompt treatment reduces the incidence of this complication or whether it may be predicted. The part that surgery has to play in management is still undecided. The purpose of this paper is to present an analysis of the cases of partial thoracic stomach attending the Hospital for Sick Children, Great Ormond Street, over a period of 10 years. Most of these cases were included in an interim report by Waterston (1954).

Material

During the 10 years 1945 to 1955 137 children attending the hospital were diagnosed as having partial

thoracic stomach, and 132 of these had a small intrathoracic loculus of stomach. In the other five the hernia comprised most of the stomach, and, as the problems presented were rather different, they are considered separately. Only cases followed up for longer than nine months have been included. In Table I the duration of the follow-up period is shown.

TABLE I.—Duration of Follow-up of 137 Cases of Partial Thoracic Stomach

	Follow-up Period (Years)							
	<1	1-2	2-3	3-4	4-5	5-7	7-10	10
No. treated medically ..	13	13	8	17	8	4	2	3
No. treated surgically ..	4	7	13	14	15	8	5	3
Total ..	17	20	21	31	23	12	7	6

Sex and Familial Incidence.—There were 97 boys and 35 girls in this series—that is, a male:female ratio of 2.7:1. The disease was more severe in the males, half being below the third percentile in weight when first seen, compared with one-quarter of the females. Thirty-three children (25 males and 8 females) had a stricture. The mother and sister of one child were found to have a partial thoracic stomach, the sister having attended the hospital 12 years previously on account of vomiting. Twin boys were both affected. The brother of another child was operated on elsewhere for an oesophageal stricture. A history of vomiting in parents and siblings was often obtained but was not followed up.

Symptomatology

Vomiting.—The typical history was one of vomiting from birth. Birth was given as the time of onset in 102 children (77%), and in a further eight vomiting started within the first month of life. In the remaining 22 the age at onset was given as between 1 and 3 months in five, between 3 and 6 months in six, between 6 and 12 months in five, and in six the onset was after 1 year of age. Vomiting might be projectile. Thirteen of these children had been operated on for suspected pyloric stenosis, and a pyloric tumour was found in three. A study of the case histories revealed a very characteristic sequence of events. In uncomplicated cases improvement began with the introduction of solids, and vomiting was infrequent after the first year. The mother often remarked that vomiting ceased completely when the child began to walk, but it was common for vomit to be found on the pillow at night for some weeks after it had ceased in the day. Laughing or jolting was noticed to precipitate vomiting. With stricture formation the pattern changed and vomiting tended to become episodic, attacks lasting for several days being interspersed with periods of comparative freedom, dysphagia gradually becoming the predominant symptom, and difficulty in making the child take solids the mother's main problem.

Haematemesis occurred in 117 (89%), of the 132 children with a small intrathoracic loculus of stomach, and in eight it was associated with melaena. Altered blood was often seen mixed with mucus in the vomit within a few days of birth. Its presence is highly significant, because vomiting at this age is very common; but haematemesis, apart from the regurgitation of swallowed blood in the first day or two of life, is unusual. A large haematemesis was

exceptional. Considerable bile-staining of the vomit was noticed in two cases. The absence of constipation, coupled with the frequency of haematemesis, is an important point in the differentiation of partial thoracic stomach from pyloric stenosis in an infant presenting with vomiting and unsatisfactory weight gain.

Dysphagia was an ominous symptom, usually the culmination of a sequence of events such as the following. The mother would say that when the infant was offered thickened feeds between 3 and 6 months of age vomiting became less, but solids such as biscuit and bread resulted in choking. She waited for a time and then tried again, with the same result; and so the infant continued on a milk and purée diet, and finally advice was sought on account of dysphagia with solids when he was about a year old. In some cases vomiting persisted as the predominant symptom and dysphagia was not clearly distinguished from it. Dysphagia was noted in 50 out of 132 cases (38%), and was associated with radiological evidence of narrowing of the oesophagus in 40. In 10, free reflux only was present. For the purpose of this review each case has been placed in one of four clinical groups at the time of follow-up (Table II). Group 4 includes four children who died. It will be seen that dysphagia was of considerable prognostic importance, for only 11% of the children who were symptom-free had complained of dysphagia, as compared with over 70% of those with fairly severe and very severe symptoms—that is, cases in groups 3 and 4.

TABLE II.—Prognostic Significance of Dysphagia

	Group 1	Group 2	Group 3	Group 4
Clinical grouping of 132 cases	65	44	10	13
No. with dysphagia ..	7 (11%)	26 (59%)	9 (90%)	8 (61%)

Group 1: Symptom-free at time of follow-up.
Group 2: Mild symptoms only at time of follow-up.
Group 3: Symptoms fairly severe, but tendency to improvement at time of follow-up.
Group 4: Persistent severe symptoms at time of follow-up.

Weight.—The weight of these children was generally well below average when they first presented, the majority falling below the fiftieth percentile. Severe dehydration was occasionally present, especially during the early weeks of life. Of the 132 children, 59 were below the third percentile on their first visit to the hospital; 50 of these were boys and 9 were girls. At their first attendance 85 children were under 1 year of age, and only four of these had reached the fiftieth percentile. It follows, therefore, that partial thoracic stomach is unlikely to be the cause of vomiting in an infant whose gain in weight is average, or above average.

Anaemia may be due partly to loss of blood and partly to malnutrition. Of the 132 children, 112 had an oesophagoscopy and haemoglobin estimation done at about the same time, and Table III shows that the degree of anaemia is related to the severity of oesophagitis.

TABLE III.—Degree of Anaemia Related to Severity of Oesophagitis in 112 Cases

Haemoglobin Level	Oesophagitis on Oesophagoscopy		
	None	Mild	Severe
<50%	1	0	6
50-65%	6	5	18
65-80%	12	10	14
>80%	21	9	10

Diagnosis of Partial Thoracic Stomach and Oesophageal Stricture

Radiological Appearances.—Hodson (1954) has pointed out that while radiological diagnosis of advanced cases with persistent oesophageal narrowing and oesophagitis is comparatively easy, uncomplicated cases may present difficulties in diagnosis owing to the wide range of normal variation. It is now recognized that partial thoracic stomach may cause no symptoms, and Astley (1954) states that it can be present in the absence of demonstrable gastro-oesophageal reflux. According to Hodson (1954), reflux of gastric contents into the oesophagus is seen in barium studies of normal infants, though this is denied by Husfeldt (1953). At all events, most authorities are agreed that even when symptoms are found associated with radiological evidence of reflux, x-ray examination may need to be repeated several times before a loculus of stomach can be visualized above the diaphragm, and rapid serial pictures are very helpful in this demonstration. Most of the patients referred to the hospital with symptoms suggestive of partial thoracic stomach respond satisfactorily to simple medical measures and are not subjected to further barium studies if the first is inconclusive. Such patients were, of course, not included in the present series. In contrast, oesophageal narrowing associated with oesophagitis or organic stricture is unlikely to be overlooked even in an uncooperative child. These factors probably account for the high incidence of complicated cases in this series (45%).

Oesophagoscopy gives valuable information about the state of the oesophageal mucous membrane and the presence or absence of stricture formation. The oesophagus may be filled with acid or alkaline fluid, and reflux often occurs during the examination. In any one case the appearance on oesophagoscopy was found to vary considerably at different examinations. Table IV shows the severity of oesophagitis on the first examination in relation to clinical condition at the time of the follow-up in 110 children on whom oesophagoscopy was performed. The majority were symptom-free or had mild symptoms only, and were placed in groups 1 and 2 regardless of the severity of oesophagitis initially, but persistence of oesophagitis was of ominous significance, as it finally led to the formation of a stricture.

Prognostic Significance of Narrowing of the Oesophagus

The term "stricture" implies narrowing, which in the case of the oesophagus may be due to spasm of the muscular wall or to fibrous contracture. The diagnosis of narrowing can be made radiologically, by oesophagoscopy, and at operation. If persistent narrowing of the oesophagus with dilatation above is accompanied by rigidity of walls and hold-up of thick barium, there is no doubt that organic stricture is present.

On the other hand, narrowing of the oesophagus may be demonstrated which is inconstant and is probably due to spasm. Throughout this paper the term stricture is therefore used to imply organic fibrous contracture and the other cases are referred to as "oesophageal narrowing."

Table V shows the clinical grouping of the cases at the time of the follow-up in relation to the presence or absence of oesophageal narrowing and organic stricture. In 72 cases there was no evidence of oesophageal narrowing. Six of these children were mentally retarded and account for two of the four placed in groups 3 and 4. Thirty-three children had an organic stricture. Operation was carried out in 25, and in 13 no stricture was demonstrable at the time of the follow-up. This group of 33 included four mentally retarded children who were placed in groups 3 and 4. Narrowing of the oesophagus was found radiologically or on oesophagoscopy in 27 children, but was not persistent. Twenty were operated on, and in nine no narrowing was present at the time of follow-up.

It will be seen from Table V that 94% of the children with no evidence of oesophageal narrowing were placed in groups 1 and 2. In contrast, 69% of

TABLE V.—*Prognostic Significance of Oesophageal Narrowing and Organic Stricture*

	Total	Group 1	Group 2	Group 3	Group 4
No oesophageal narrowing	72	51 (70%)	17 (24%)	2 (3%)	2 (3%)
Organic stricture	33	3 (9%)	20 (60%)	3 (9%)	7 (22%)
Variable oesophageal narrowing	27	10 (37%)	8 (30%)	5 (18%)	4 (15%)

those with organic stricture and 67% of those with variable oesophageal narrowing were placed in groups 1 and 2. These figures indicate that the presence of variable narrowing or organic stricture of the oesophagus materially alters the prognosis.

Association of Partial Thoracic Stomach with Other Conditions

Pyloric Stenosis.—In 13 cases laparotomy was performed for suspected pyloric stenosis in this hospital or elsewhere, and a tumour was found in three. In one child a pyloric tumour was felt at the age of 3 years when he had developed a stricture. The association of partial thoracic stomach and pyloric stenosis has been noted before (Smellie, 1954), and it may well be that any condition giving rise to vomiting will aggravate or initiate the symptoms of an existing hiatus hernia. Olsen and Harrington (1948), reviewing 220 cases of "short oesophagus" in adults seen at the Mayo Clinic, noted an apparent aetiological factor in 78%, and in almost one-third of these it was some condition giving rise to vomiting. An attack of whooping-cough caused an exacerbation of symptoms in several of our cases.

Abnormalities of the glottis or trachea causing stridor occurred in five children, and on one of these severe

TABLE IV.—*Clinical Condition at Time of Follow-up Related to Severity of Oesophagitis on First Examination (110 Cases)*

Treatment	No Oesophagitis				Mild Oesophagitis				Severe Oesophagitis			
	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4
Medical	12	10	0	0	5	8	1	0	10	4	1	3
Surgical	7	9	1	0	4	2	2	2	10	11	2	6
Total	19	19	1	0	9	10	3	2	20	15	3	9

stridor during the induction of anaesthesia necessitated tracheotomy, and the operation for repair of her hernia was abandoned. Cleft of the soft palate was associated with partial thoracic stomach, sucrosuria, and mental defect in one child.

Mental retardation was present in 10 children; two of these had phenylketonuria and four sucrosuria. One child with phenylketonuria and severe mental and physical retardation presented at the age of 3½ years with a tight fibrous stricture. She died a year later in another hospital, and at post-mortem examination a large oesophageal ulcer was found.

Moncrieff and Wilkinson (1954) have described the association of sucrosuria, mental defect, and hiatus hernia. The three conditions were present together in four cases in this series.

Management of Partial Thoracic Stomach in Childhood

Table VI relates the age at which the child first attended the hospital to the clinical category at the time of follow-up. It shows that the prognosis in children presenting under the age of 1 year is very good. Of 81 cases, 74 (91%) were placed in groups 1 and 2. Only four of the 61 children who first attended under the age of 6 months have been placed in groups 3 and 4. Two of these had a stricture when first seen (one died of gastro-enteritis in another hospital). The third child was severely retarded mentally with sucrosuria and a cleft-palate. The fourth child first attended at the age of 5 months with a large hernia and was treated surgically. Symptoms persisted and the hernia was found to have recurred. She was awaiting a second repair at the time of writing.

TABLE VI.—*Prognosis Related to Age at Which Child First Presented*

Age at 1st Attendance	Total	Group 1	Group 2	Group 3	Group 4
<6 months ..	61	44	13	2	2
6-11 " ..	20	8	9	1	2
1 year ..	32	12	12	2	6
2 years ..	4	0	3	1	0
3 " ..	5	1	1	1	2
4 " ..	2	0	1	1	0
5-7 " ..	4	0	2	2	0
8-10 " ..	3	0	2	0	1
>10 " ..	1	0	1	0	0
<1 year ..		90%		10%	
>1 " ..		70%		30%	

There are two possible conclusions to be drawn from these findings. Early treatment, whether medical or surgical, may prevent the occurrence of oesophagitis and stricture formation. On the other hand, as it seems probable that the majority of untreated cases recover spontaneously (Carré *et al.*, 1952) it may be that those presenting later would not have responded to treatment even had it been instituted in the first few months of life. Against this latter suggestion we have no uncomplicated cases presenting under the age of 6 months, and adequately treated, who have not done well.

Medical Treatment

Medical treatment is satisfactory in most cases of partial thoracic stomach. The infant is maintained in as near an upright position as possible throughout the day and night in a chair specially constructed for the purpose, and feeds are thickened if necessary. In

untreated cases improvement usually follows the introduction of solids, and symptoms often cease altogether when the child gets on to his feet. Carré *et al.* (1952) state that after symptomatic improvement the partial thoracic stomach persists unchanged, though reduced or absent reflux makes it more difficult to demonstrate. Husfeldt (1953) observed 25 cases treated medically, and the hernia disappeared in seven. In the present series follow-up barium studies were not made routinely. Fifty-three cases of partial thoracic stomach showing no evidence of stricture formation or oesophageal narrowing were treated medically. X-ray findings remained unchanged in 23, and 11 of these were symptom-free at the time of the follow-up. In 11 the hernia disappeared, and 8 of these were symptom-free. In 19, follow-up x-ray examinations were not carried out.

Sixty-eight children were treated medically—in 53 there were no complications, 8 had organic strictures, and 7 had variable oesophageal narrowing. Table VII shows the clinical grouping at the time of follow-up. Two of the three cases in group 4 were

TABLE VII.—*Clinical Grouping at Time of Follow-up of Cases of Partial Thoracic Stomach Treated Medically*

	Total	Group 1	Group 2	Group 3	Group 4
Uncomplicated cases	53	38	13	1	1
Organic stricture ..	8	0	6	1	1
Cases with variable oesophageal narrowing ..	7	3	2	1	1
Total ..	68	41 (60%)	21 (30%)	3 (5%)	3 (5%)

severely retarded mentally, and one child, mentioned previously, died of gastro-enteritis in another hospital. Of those treated medically, 90% were placed in groups 1 and 2 at the time of follow-up.

Surgical Treatment

The question arises whether surgery plays any part in the management of partial thoracic stomach in childhood, and, if so, the best time for surgical intervention. Opinion is divided on this subject. Stricture formation is the main complication. It is presumed that reflux of gastric juice into the oesophagus causes erosion of the mucous membrane, and chronic inflammatory changes result in fibrous contracture. There is no doubt that this process can take place over a very short period of time. Four children presented under the age of 7 months with a stricture, the youngest being 2 months old.

The aim of the operation carried out at this hospital is to restore the normal anatomy so far as is possible by reduction of the hernia and narrowing of the hiatus. By this means the normal angle of insertion of the oesophagus into the stomach is at least partially restored. If a stricture is present it is dilated via the stomach at the time of operation.

Of the 64 children subjected to surgery, 38 had some narrowing of the oesophagus demonstrated radiologically or on oesophagoscopy before operation—organic stricture was present in 25 and variable oesophageal narrowing in 13. In recent years the number of uncomplicated cases treated surgically has steadily declined, especially in children under 1 year of age. The clinical grouping of the cases treated

surgically is shown in Table VIII. The number of children in each group under 1 year of age at the time of operation was: group 1, 7; group 2, 8; group 3, 0; and group 4, 1.

In 19 cases treated surgically the partial thoracic stomach was uncomplicated or was accompanied by mild oesophagitis only. At the time of the follow-up 13 were placed in group 1 and 4 in group 2. The one

TABLE VIII.—*Clinical Grouping at Time of Follow-up of Cases of Partial Thoracic Stomach Treated Surgically*

	Total	Group 1	Group 2	Group 3	Group 4
Uncomplicated cases	19	13	4	1	1
Organic stricture ..	25	4	13	2	6
Cases with severe oesophagitis ..	20	7	6	4	3
Total	64	24 (38%)	23 (35%)	7 (11%)	10 (16%)

child in group 3 had persistent symptoms, and a loculus of stomach was still present above the diaphragm after operation. She is waiting a second repair. A severely retarded child with phenylketonuria was placed in group 4.

An organic stricture was found at operation in 25 cases. In 13 a stricture was no longer demonstrable at the time of the follow-up and all were placed in groups 1 or 2 except for one in group 3 who still had dysphagia and recurrent episodes of vomiting though usually able to take a normal diet. In six children some narrowing of the oesophagus was still present, five were doing well and satisfied the criteria for groups 1 and 2, and one was placed in group 3.

Six children with organic stricture at operation were placed in group 4. Two died of pneumonia, in two the stricture was excised but recurred, and two had persistent oesophagitis with severe symptoms in spite of a successful repair of the hernia.

In 20 children operation was done on account of severe oesophagitis. Oesophageal narrowing was present before operation in 13. At the follow-up 7 were placed in group 1, 6 in group 2, 4 in group 3, and 3 in group 4 (including one mongol). The hernia recurred in one mentally retarded child operated on at the age of 2 years and a second operation was considered, but 18 months later he began to improve and at the follow-up when 6½ years old he was symptom-free.

During the past year oesophago-gastrectomy has been carried out on seven of the children placed in groups 3 and 4.

It is noteworthy that in only 12 cases was there an immediate response to operation with cessation of symptoms. In the others improvement had sometimes begun before surgery was undertaken, but more often it was not evident until months or even years afterwards. This makes it difficult to assess the value of surgery. The fact that vomiting readily becomes habitual in children may partly explain the delayed response to treatment in some cases.

If two children whose hernia recurred after operation and two with severe mental defect are excluded, 11 out of a total of 64 children (17%) appeared to derive little or no benefit from repair of the hernia. An organic stricture was present before operation in five and severe oesophagitis with or without oesophageal narrowing in six. Three of these developed an organic stricture after operation.

Cases with a Large Intrathoracic Loculus of Stomach

In five children the cardia was found to be above the diaphragm, with a large loculus of stomach lying in the right chest. These cases had certain features in common; all were girls, the intrathoracic loculus of stomach could be seen on straight x-ray examination of the chest, and four were severely anaemic. The response to operation was immediate, with complete relief of symptoms.

Discussion

The difficulties encountered in evaluating the role of surgery in cases of partial thoracic stomach have been mentioned. As symptoms probably subside spontaneously in most cases the age at which the child first presents is obviously of great importance and also his age at the time of operation. The clinical condition bears no close correlation to the findings on oesophagoscopy and barium swallow, and throughout this paper there has been repeated reference to the clinical classification based on symptomatology and general health. Operation was performed on the majority of children with persistent oesophagitis; for this reason we are not able to compare the results of medical and surgical treatment, and our conclusions can only be tentative.

It is felt that cases presenting without evidence of oesophageal narrowing should be treated medically, but must be kept under close supervision. If symptoms are controlled and the gain in weight is satisfactory frequent barium studies and oesophagoscopies are unnecessary. Unsatisfactory gain in weight, haematemesis, anaemia, and dysphagia are indications that all is not well, even if the mother reports that vomiting is subsiding. In such cases oesophagoscopy is carried out periodically, and persistent oesophagitis with or without narrowing of the oesophagus is taken as an indication for surgery. Cases presenting with a stricture and oesophagitis, and those with a large intrathoracic loculus of stomach, are subjected to operation without delay.

Older children who have organic strictures *without* oesophagitis are treated conservatively by oesophageal dilatation as required. There were eight such children in the present series and two were mentally retarded. Though these children suffer the severe handicap of dysphagia the tendency is towards improvement as they grow older.

The children with severe persistent oesophagitis due to gastro-oesophageal reflux present the greatest problem in management, whether they have a stricture or not. Eleven such children derived no benefit from surgical repair of the hernia. Their lives were punctuated by recurrent admissions to hospital for treatment of vomiting, and intravenous fluids were often necessary to correct dehydration. Nutrition was impaired and anaemia invariably present in spite of iron therapy and blood transfusion. During the past year oesophago-gastrectomy has been carried out on seven of these children, and the immediate results of the operation are encouraging.

The clinical features of partial thoracic stomach in childhood have again been stressed, for prompt postural treatment undoubtedly relieves symptoms in young infants and probably reduces gastro-oesophageal reflux. An infant who consistently fails to thrive is best referred to hospital for investigation, and it should

be remembered that peptic ulceration of the stomach and duodenum is very rare in early childhood and the oesophagus is the most probable site of the bleeding in a young child with haematemesis.

Summary

The symptomatology, diagnosis, and management of 137 children with partial thoracic stomach are discussed. The main symptoms in 132 with a small intrathoracic loculus of stomach were vomiting (dating from birth in 77%), haematemesis (89%), dysphagia (38%), and unsatisfactory gain in weight. Males predominated by 2.7:1 and were more severely affected than females.

The prognosis in children presenting under 1 year of age was very good in 91%. Dysphagia and narrowing of the oesophagus were of serious prognostic significance.

Organic fibrous contracture of the oesophagus was present in 33 children, in 27 there was variable oesophageal narrowing, and in 72 there was no oesophageal narrowing (uncomplicated cases).

Of the 10 children who were mentally retarded, two had associated phenylketonuria and four had sucrosuria.

Sixty-eight children were treated medically and 64 surgically. The results are discussed. It is concluded that persistent oesophagitis with or without stricture formation is an indication for repair of the hernia. Uncomplicated cases and older children with strictures are given a trial of medical management.

Five children, all girls, had a large right-sided intrathoracic loculus of stomach and were symptom-free after surgery.

I thank Mr. D. J. Waterston and Professor R. S. Pilcher for permission to publish these cases; the physicians at the Hospital for Sick Children, Great Ormond Street, who referred cases under their care to the thoracic unit; and Dr. J. Sutcliffe and Dr. J. W. Wells, who did the fluoroscopies. I am especially indebted to Dr. R. E. Bonham-Carter, who suggested this review and gave much advice and encouragement.

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Dr. ALEKSANDRA TAYLOR, a Polish child-specialist who has been awarded a British Council bursary for two months' study here, derives her name from a Scottish "soldier of fortune" who fought in the religious wars in Poland. During the seventeenth century large numbers of Scots emigrated to Poland and took part in commerce or became craftsmen. An interesting booklet entitled *Scots in Old Poland*, and published for the Scottish-Polish Society by Oliver and Boyd Ltd. in 1941, says, "For centuries Scotland had been the recruiting ground of mercenaries for all nations . . . in the last three decades of the sixteenth century we find definite information of Scottish soldiers and officers engaged in the Polish service." In the year 1775, according to this booklet, the name Tayler (Taylor) is found among the list of enrolled officers.

CRANIOSTENOSIS

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Craniostenosis is a not uncommon condition of skull deformity caused by premature fusion of the sutures with consequent cessation of growth. The term was introduced by Virchow in 1851, although the condition had been known for a long time, and Bachman (1908) stated that the deformity and its relationship to the sutures were known to both Hippocrates and Galen. There is an extensive literature, mostly containing case reports and reviews of the literature, the reports usually citing severely affected cases, often with blindness. Only two large personal series have been reported, and these by neurosurgeons who have operated on them and presumably have seen selected cases: Ingraham, Alexander, and Matson (1948) reported on 50 cases, and McLaurin and Matson (1952) on 36 cases operated on in the first six months of life.

I have attempted to evaluate the seriousness and significance of the condition, and report here on 37 cases; these represent all the cases in Africans I have seen. They have been found by searching amongst the patients presenting at a paediatric out-patient clinic and at the casualty department of a hospital. In addition, approximately one-third were found at a social work centre. I have ensured that not only gross cases were picked out, and it is significant that not one of these cases has presented with complaints related to the craniostenosis. Thus these cases represent an unselected series, and analysis should therefore approximate to the true picture of the disease.

Normal Skull and Brain Growth

The skull grows secondarily to the brain; should the brain fail to grow, as in microcephaly, so will the skull. And where brain size becomes excessive, as in hydrocephalus, so does skull size. Indeed, the digital markings normally found in skull x-ray films in childhood suggest that the pressure caused by the growing brain stimulates skull growth. This growth occurs at the sutures, at right angles to them. Thus growth at the coronal suture is responsible for the length of the forehead, at the lambdoid suture for the length of the posterior head, and at the sagittal suture for its

FIG. 1.—Three cases of premature sagittal suture fusion showing elongation of the heads. The two outer boys are brothers. When viewed from above the middle portion of the head is narrow.