A REVIEW OF NEONATAL OBSTRUCTIONS OF THE GASTRO-INTESTINAL TRACT*

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Klerksdorp

The surgery of infancy has made considerable progress during the past two decades. In particular a continuing decline has taken place in the number of infants dying from obstructive lesions. This development has taken place by virtue of (*a*) earlier recognition of serious pathological conditions, (*b*) improved supportive therapy, (*c*) prompt operative treatment and (*d*) advances in anaesthesia. Infants tolerate operative treatment remarkably well when these favourable factors are combined with careful and gentle operative technique. Infant surgery relating to obstructions arises from congenital defects. As these are frequently multiple, the necessity for careful examination to discover additional defects cannot be overstressed. Many will have no bearing on the treatment or its outcome; others may be so serious as to prevent operative interference.

In this review the sequence of lesions presented will generally

* Based on a paper read to the Potchefstroom Division of the Medical Association of South Africa.

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follow their position in the gastro-intestinal tract. Operative details and techniques are not included.

THE OESOPHAGUS

Atresia

By definition, the obstruction in atresia is complete. Upwards of 90% have, in association with the discontinuity, a fistula between the lower segment and the trachea. A variety of arrangements occur in the remainder. Immediate recognition of the obstruction is important. Significant features include apparently excessive salivation owing to the blocked swallowing mechanism, hungry attempts at feeding followed by regurgitation, and gagging and coughing, possibly with cyanosis, owing to laryngeal spill-over. The latter, together with tracheal aspiration of gastric juice *via* the fistula soon causes serious pneumonia. Confirmation of the block is obtained by passing through the nose a fine soft rubber urethral catheter, which will impact at the level of obstruction. A plain X-ray of the abdomen will show a gastric air-bubble if a fistula is present. A few c.c. of lipiodol (not barium) instilled into the oesophagus via the nasal catheter will demonstrate the block.

Dangers which must be avoided are aspiration pneumonia from saliva, feeds and gastric juice, and dehydration. The infant should be propped up and the secretions aspirated *via* a nasal catheter. Penicillin should be given to prevent pneumonia. Parenteral fluid to the amount of 10 c.c. per lb. body-weight twice daily plus the amount aspirated should be administered. It may be given subcutaneously with hyalase as half-strength saline with 5% glucose water in equal amounts, or intravenously without hyalase.

Examination for other defects is made. Some of these may require operative relief, e.g. imperforate anus. Thoracotomy is conducted as soon as the baby is in fit condition. This may require a delay of up to 36 hours after the initial diagnosis is made and treatment is begun.

Congenital Stenosis

Because of the fluid nature of the diet, this lesion does not present early in life unless the stenosis approaches complete occlusion. A proportion of cases will present when the change-over to semi-solid or solid foods takes place. Characteristic early features are regurgitation at feeding time, a tendency to choke from tracheal spill-over, and failure to thrive. A thin barium-mixture swallow will show the stricture with some degree of dilatation of the oesophagus above. The sheet anchor of treatment is repeated dilatation of the stricture preceded in some instances by gastrostomy. In refractory cases resection is necessary.

LESIONS OF THE CARDIO-OESPHAGEAL AREA

Achalasia, Spasm and Stricture

Peptic oesophagitis causing spasm and symptoms of stricture sometimes occurs in this age-group. In time, spasm from inflammatory lesions will gradually merge imperceptibly with *fibrous stricture*. *Neuromuscular imbalance* will show similar features. Differentiation between congenital stenosis, neuromuscular imbalance and spasm is not of practical importance, because unrelieved spasm will require dilatation as well as achalasia and stenosis.

Chalasia and Hiatus Hernia

Chalasia refers to a neuromuscular disorder in which the lower oesophagus and stomach are lacking in normal tone and peristaltic movement. The pinchcock action at the oesophago-gastric junction is absent. The surgeon may be called to see the case because of regurgitation and vomiting of feeds soon after birth. Horizontal posture will be observed to make the condition worse. If severe, the baby will not thrive. Oesophagitis and pulmonary complications will follow.

Similar features are shown with hiatus hernia. Barium swallow will show free regurgitation in both instances, with a sliding element in addition in hiatus hernia. The latter condition may be associated with spasm and in time may lead to stricture formation. Conservative measures should include frequent smaller and perhaps thickened feeds, semi-upright posture, and antacids.

THE STOMACH

Congenital Pyloric Stenosis

About three-quarters of babies with this obstruction are males. There is a higher incidence in first-born babies and occasionally a familial incidence. Few show symptoms before the 10th day, when the child begins to regurgitate feeds, returning more after each feed until the vomit becomes forceful in character. With less entering the bowel, the child becomes progressively more constipated and fails to gain weight or loses weight and becomes dehydrated. Unless weakened by starvation, hungry attempts at feeding are made. Diagnosis in the great majority is established clinically. As the obstruction is pyloric, the vomitus does not contain bile. The time of onset rules out an atresia. Oesophageal stenosis will be seen to be unlikely because the child accommodates a good volume of the feed before returning it, and there is no coughing and gagging. The triad of the typical history, visible gastric peristalsis, and the palpation of the pyloric tumour in the right upper abdomen, establishes the diagnosis. In doubtful cases, pylorospasm, bad feeding regime, incomplete rotation of the gut, annular pancreas, and intracranial injury have to be considered. In cases which have not progressed to starvation, dehydration and electrolyte imbalance, operation is probably safe without pre-operative parenteral fluids; pre-operative oral glucose water and glucose saline will suffice. In worse cases parenteral fluids should be given. Nasogastric deflation is adopted in all cases before operation.

THE SMALL INTESTINE

Atresia and Stenosis

Atresias, as opposed to stenoses, are frequently multiple. In both cases, upwards of 95% occur in the small gut as opposed to the large gut. About half of the stenoses of the gut and a quarter of the atresias occur in the duodenum. Both are almost invariably below the level of the ampulla of Vater and the vomitus therefore contains bile. Obstructive signs are apparent soon after birth in all atresias. The majority of stenoses show up in the first month of life. The remainder present at the time of dietary change and a few during childhood—the latter often with a history of abdominal pains. Vomiting, at first of biliary material and later of brownish fluid when the obstruction is in the jejunoileal, area, is the first symptom. Distension, not present in high obstruction, is usually well marked, with 'laddering' from successive loops in lower lesions. The anus should be inspected and gentle digital rectal examination conducted with a well lubricated little finger. Farber's test—the microscopic examination of stained meconium for cornified epithelial cells—is useful. If negative, an atresia is present. If positive, stenosis or some other obstruction (excluding atresia) exists. Radiology may or may not show distended loops or fluid levels if the obstruction is high. The speckled appearance of meconium ileus is absent. In isolated cases, spotty calcification from healed pre-natal perforation and sterile peritonitis may be seen. Laparotomy must be undertaken whenever possible. Important pre-operative measures include examination for other deformities, parenteral fluid, nasogastric decompression, vitamin K, and antibiotic cover—the latter to avert chest complications.

Meconium Ileus

This generalized disease first manifests itself by intestinal obstruction caused by thick, tarry, tenacious meconium. There is widespread disturbance of the mucus-secreting glands of the respiratory and gastro-intestinal tracts, with reduction of pancreatic secretions. Relief of obstruction is followed by disturbances of nutrition and proclivity to respiratory infection. Intestinal obstruction is apparent soon after birth. There may have been one or two stools or complete constipation. The well-marked distension indicates a low bowel obstruction. Factors which favour a diagnosis of meconium ileus are: (*a*) A history of obstruction in another member of the family—occasionally more than one member is affected, (*b*) the palpation of pultaceous masses in the lower abdomen, and (*c*) wide variation on X-ray in the size of the intestinal loops and granular appearance of the putty-like masses of meconium. At times the stippling of calcification referred to above is present. Important measures in therapy include antibiotic cover, the correction of fluid and electrolyte deficit, naso-gastric suction, and the administration of vitamin K.

Blood should be available at operation as well as pancreatic enzymes for post-operative use.

Anomalies of Rotation of the Gut

The majority of cases requiring operation for malrotation present during the first month of life. Well-marked obstructive features are shown by this group and those occurring during babyhood. The smaller number presenting during childhood do so with an intermittent history.

These obstructions arise as follows: (*a*) Duodenal obstruction caused either by an incompletely rotated caecum exerting pressure on the descending duodenum or by a peritoneal fold extending across this portion of the duodenum from caecum and ascending colon to the postero-lateral abdominal wall. (*b*) Incomplete rotation is associated with varying degrees of lack of fixation of the normally fixed portions of the gut, including the second and third parts of the duodenum, duodeno-jejunal flexure, terminal ileum, and ascending colon. This laxity together with the abnormally mobile mesentery encourages rotation (which is usually clock-wise as one faces the patient) of portions or the whole of the mid-gut. This duodenal obstruction and mid-gut volvulus may occur independently or, in a high proportion of cases, may co-exist. Volvulus may produce closed-loop obstruction only, or may progress to strangulation. The area affected may vary from a small sector to the whole of the mid-gut.

Clinically, there is usually a history of normal or relatively normal bowel activity at first. There is evidence of high obstruction, with bile in the vomitus. Distension may be absent until gas accumulates in the initially collapsed loops. The baby's condition deteriorates rapidly with the onset of strangulation. In cases presenting in the first few days the picture is usually indistinguishable from atresia, well-marked stenosis, or meconium ileus. Distinction is not important; pre-operative measures are the same as for these conditions.

Annular Pancreas

This abnormality is important because of the obstruction it may produce and because of the commonly associated pancreatitis. A minority of these cases (where the lumen is markedly narrowed) present in the neonatal period. The pancreatic tissue may partly or, more frequently, wholly encircle the descending duodenum. The vomitus may or may not contain bile, depending on the relationship of the constriction to the ampulla of Vater. The symptoms may be intermittent or may be those of complete obstruction. Stenosis, atresia and volvulus enter into the differential diagnosis. A plain X-ray film may show distension of the duodenum and stomach or may not be helpful. Electrolyte and fluid imbalance should be corrected, nasogastric suction instituted, and a search made for other abnormalities before a laparotomy is undertaken.

CONGENITAL DIAPHRAGMATIC HERNIAS

Because of the complicated sectional development of the diaphragm, sites of incomplete development or of non-fusion allow of herniation. Such herniae usually do not have a sac and always extend from below upwards.

The commonest site is the left postero-lateral area of the diaphragm, where an aperture of varying size may occur. Other sites of herniation include the right postero-lateral and retro-sternal areas of the diaphragm, and the oesophageal hiatus. Hernias of the oesophageal hiatus produce symptoms when reflux is marked. The oesophageal type may be of the sliding variety or, in rare cases, it may be associated with a congenitally short oesophagus (intrathoracic stomach).

Postero-lateral hernias produce circulatory and respiratory symptoms from compression of the lungs and mediastinum. Cyanosis and dyspnoea may be present from birth in severe cases or may appear during nursing or crying. Relief may result when the infant is placed on the affected side, allowing greater expansion of the opposite lung. Gastro-intestinal symptoms may be minimal, ranging from failure to thrive, with occasional regurgitation or vomiting, to severe vomiting with complete obstruction and even strangulation. Examination of the chest may show reduced movement on the affected side, mediastinal displacement and a tympanitic note on percussion, depending on the extent of the herniation. Bowel sounds may be heard in the chest. Confirmation is obtained on plain X-ray. Hiatus herniae do not exhibit physical signs.

In some hiatus herniae, and in all postero-lateral herniae, operation is indicated. Pre-operative gastric decompression is important to facilitate reduction of the viscera and closure of the diaphragm and abdomen. Cognizance should be taken of other abnormalities and fluid losses corrected. Blood should be available.

OTHER LESIONS

Internal and External Herniae, etc.

On rare occasions internal herniae—paraduodenal, retrocoecal and fenestrations of the mesentery—may obstruct. Congenital bands, such as Meckel's, or unusual peritoneal folds, may also cause obstruction and strangulation. An inguinal hernia may occasionally incarcerate in the neonatal period and when not reducible by taxis operation is proceeded with forthwith.

Atresia and Stenosis of the Colon

The colon is uncommonly involved in atresia or stenosis and when these lesions in the small bowel are multiple, the colon is spared. Distension is a well-pronounced feature. Radiological signs of obstruction are well shown. Anal inspection and rectal examination are mandatory.

Ano-Rectal Malformations

These abnormalities may be classified into the following clinical and practical groups: (1) The anus is perforate. Stenosis is present in the lower rectum or anus. The anatomy is otherwise normal but for an occasionally associated fistula. (2) Imperforate anus is present owing to a diaphragm obstruction only. This represents the least degree of imperforate anus. As with the stenosis group, fistula is only occasionally associated. (3) Imperforate anus, the rectum ending blindly at a variable distance away from the anal skin. The great majority of fistulae are associated with this group. Usually the anal musculature is present and a dimple represents the anal site. The majority of ano-rectal malformations fall into this group. (4) The lower rectum and the anus are normal, the upper blind rectal pouch ending at a variable distance above. Fistulae do not occur with this group, or very rarely.

About 70% of these disorders are associated with fistulae of one type or another. In males, fistulae communicate with the trigonal area of the bladder (recto-vesical), with the membrano-prostatic urethra (recto-urethral), or with the perineum anterior to the anal area. In females they communicate with the vagina (recto-vaginal), with the fossa navicularis posterior to the hymen, or with the perineal skin between anus and vagina.

Only about half the fistulae seen are wide enough to allow evacuation of the rectum. When they are large the defects may remain unrecognized for some time. The great majority of fistulae are associated with an imperforate anus with the rectum ending at a variable distance above. Careful examination of the perineum is conducted and, in males, urine examination for faecaluria is carried out. External and approachable vaginal fistulae are probed in order to determine the lower limit of the rectum, and palpated externally with a finger. Where an open anus exists, digital examination to determine a possible rectal block (group 4) or a bulging anal diaphragm (group 2) is carried out. Other abnormalities are searched for.

In imperforate cases a plain X-ray is of great value. By the end of the first day of life, gas reaches the farthest extent of the rectum and at this stage an X-ray (preferably lateral view) is taken, with the baby inverted and with a marker at the anal dimple. The distance from the blind pouch to skin can thus be gauged. This information (helped by that obtained by probe where possible) is of great practical assistance in determining the approach to be used in group-3 cases. Immediate operation is essential in the obstructive lesions. The type of surgery conducted is dependent on a number of factors, including the group into which the lesion falls, the presence of a fistula and its type, the degree of obstruction, the distance of the blind pouch from skin, the co-existence of other abnormalities, and the skill of the surgeon and the anaesthetist in handling this type of case.