REPORT OF A CASE OF THRICE OCCURRING RETROGRADE INTUSSUSCEPTION OF THE EFFERENT LOOP OF JEJUNUM THROUGH A GASTRO-ENTEROSTOMY STOMA WITH A THEORY AS TO THE AETIOLOGY

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In the past 35 years there have been over 40 cases reported of retrograde intussusception of the efferent loop of the jejunum into the stomach through a gastro-enterostomy stoma.

Although these cases have been recorded, there seems to be little in the way of explanation of the mechanism of retrograde intussusception. Some suggestions as to aetiology have been put forward by different authors, but these have not successfully stood up to the criticisms of the proposers themselves.

An effort has been made to consider the problem in the light of physiological principles in an attempt to understand the mechanism of retrograde intussusception.

Case Report

Patient: R. G. Male, aged 43 years. Admitted to the Whittington Hospital on April 26, 1949, with a history of stomach trouble for over 20 years. Had had four previous 'gastric' operations, dated 1934, 1940, 1946 and 1947. Subsequent enquiry revealed them to be:

- 1934. Wedge excision, chronic gastric ulcer on lesser curvature.
- 1940. Posterior gastro-enterostomy.
- 1946. Intussusception of jejunum into the stomach-reduced.
- 1947. As above.

Since his last operation, he had had more or less persistent pain in the epigastrium, relieved by alkaline tablets.

On the day of admission the patient, who was a night shift worker, was awakened at 2 p.m. with acute upper abdominal pain, followed immediately by nausea and vomiting. The patient thought there was a trace of blood in the vomitus, but he could not be certain of this. The pain was spas-

modic, each attack being accompanied by retching. He was admitted to hospital five hours after the onset of acute symptoms.

On examination the patient was seen to be a thin man with three vertical scars in the middle of his upper abdomen. There was divarication of the recti, due to atrophy of the musculature resulting from his four previous operations. The upper abdomen was tender and mildly guarded. The lower abdomen was soft, and not tender to palpation. No masses were palpable. Rectal examination revealed no tenderness or other abnormality. Temperature was normal, pulse rate 55 per minute, of good quality. The tongue was coated and moist. On abdominal auscultation some bowel sounds were heard.

A tentative diagnosis of threatened leak in an anastomatic ulcer was made. The patient was treated conservatively by means of a Ryle's tube with hourly aspirations, intravenous drip, sedation and an hourly pulse chart recording. During the next five hours the pain continued spasmodically, and at the last aspiration 5 oz. of pure blood were withdrawn, although there had been no blood in the previous hourly specimens. Between the acute attacks of pain it was noted that there was marked lessening in the epigastric tenderness and guarding. The pulse rate had not risen. The diagnosis of jejunal intussusception into the stomach was made. Operation was undertaken at once.

Operation Note

Upper midline abdominal incision performed with excision of one of the previous scars. Multiple adhesions were found in all areas of the upper abdomen. There was no free fluid or peri-

tonitis. The adhesions were slowly divided until the anatomy could be recognized and restored. The stomach was large and full, and its posterior wall had been anastomosed in retro-colic fashion to the jejunum. On raising the transverse colon, small intestine was found to be herniating through the mesocolon and filling the stomach.

The stomach was gently squeezed at the cardia between both the operator's hands, and its contents gradually reduced through the efferent loop. In this way the whole of the stomach was emptied. The apex of the intussusception was at a point about 30 cm. away from the stoma. In attempting to reduce the last few inches of oedematous gut in the proximal portion of the efferent loop, the bowel ruptured and further reduction became impossible. The remaining intussusception was resected and an end-to-end anastomosis was carried out. The distended proximal portion of the efferent loop was narrowed by several Lembert sutures in the transverse axis of the bowel in order to prevent recurrence. No attempt was made to anchor this gut. In view of the marked adhesions in all areas, partial gastrectomy was not considered advisable.

There was no evidence of anastomatic ulcer and the stoma took three fingers, although this may have been the result of stretching. The distended proximal efferent loop was about 6 cm. in diameter while the collapsed small bowel below was about 2 cm. in diameter. The stomach was dilated and the afferent loop was negligible in length. The stoma was low on the posterior aspect of the stomach about 3 cm. cephalad to the pylorus.

The patient made an uneventful recovery and was discharged within three weeks. It is now four years since his discharge, and he has had no indigestion, nausea, or vomiting. Barium meal shows normal emptying, but not any undue distension of the efferent loop. One can only be extremely guarded as to the possibility of recurrence.

Histological report of the specimen was 'Haemorrhage into the mucosa and sub-mucosa of the intussuscepted jejunum. No evidence of polyp or small bowel tumour.'

A Theory of Retrograde Intussusception

Retrograde peristalsis is a physiological mechanism of the alimentary canal. Its function is to prevent over-distension and undue hurry of the alimentary contents at all levels from the oesophagus to the large bowel. It occurs particularly at the physiological junctions, although it may occur at any point where sudden inco-ordinated localized increase of intra-luminal pressure develops. Distension of a loop of bowel causes stretching of the smooth muscle in it with resulting

onset of contraction proportional to the stretch.

Distending force (rapid filling from above)
Tonus = $\frac{\text{Distending force}}{\text{Final length of muscle}}$

A muscle of high tone or spasticity, or a large sudden distending force will result in a severe contraction with small final length of muscle.

The proximal end of the efferent loop gets enlarged particularly in the rapidly emptying stomach, develops a wider lumen and appears more relaxed than the more distal jejunum. If in rapid emptying, the loop becomes suddenly filled, the tension, stretching and change in pressure is greater in the narrowing distal part than in the relaxed proximal part. This is so, not only because the bowel is narrower and more readily stretched, but because it has a large part of the downward force or weight of the efferent loop contents above it, as well as the lateral force exerted by the contents at its own level. This narrowing portion responds with the greatest degree of contractility, and by its strong contraction raises the pressure in the loop above it so that the segment immediately above it becomes further distended. This segment then contracts, again raising the pressure above, and the sum total is an anti-peristaltic wave, arising at a point of critical maximum pressure change, which forces some of the contents back into the stomach and prevents too rapid emptying.

V. E. Henderson showed by a series of bowel muscle stretch experiments that the bowel responded to distension by contraction and by peristaltic waves. The more rapid the rise in pressure the less the actual amount of pressure required to provoke the peristalsis. Relaxed bowel requires very high pressure to produce a very small degree of peristalsis. The peristaltic wave, he says, arises at a point where the pressure changes are most effective, and this point may change its position, dependent upon changes in pressure produced by previous waves.

Anti-peristalsis is a normal feature of duodenal movement. Too rapid filling with resulting rapid rise in duodenal pressure (Thomas, Crider and Mogan), or perhaps the presence of some solid particles which have escaped the pyloric sphincter (Cannon and Kleine), are considered to be the cause of the frequent and well recognized anti-peristaltic waves commencing in the second and third part of the duodenum passing upwards through the bulb, pylorus and even the pyloric antrum. Similarly, a rapidly filling and distending efferent loop of a gastro-enterostomy stoma sometimes shows well pronounced anti-peristaltic waves radiologically, although isograde peristalsis is the more usual picture.

If a particularly violent initial segmentary con-

1. Unusually severe contraction of 1, due to unstable bowel.

2. Sudden increase of pressure at 2 causes momentary overstretching and temporary paralysis with temporary dilation at 2 creating a momentary point of relatively lower pressure at A.

3. And drawing up of spastic point 1, which is then caught by the recovery of point 2.

traction occurred, perhaps associated with irritable and spastic gut as suggested by the patient's history of indigestion, then several phenomena may occur co-incidentally:

(a) The initially contracting local segment may remain for a time in spasm.

(b) The segment above, as the result of sudden and severe rise in pressure due to (a), may become momentarily overstretched and paralysed.

(c) The violence of (a) may force the bowel contents up so powerfully that, coupled with (b), an area of relative low pressure is created just above the initially contracting spastic segment which may suck the latter upwards.

(d) The temporarily overstretched segment (b), momentarily caught unawares, then recovers and contracts down on the upward-drawn spastic segment, and by the action of its longitudinal and circular components in anti-peristaltic motion, intussuscept the spastic segment upwards.

This retrograde intussusception will continue to be propelled upwards until the increasing pressure above it equals and then exceeds the power of the anti-peristaltic wave. Distension of

the proximal loop, spreading over to the stomach excites at first ordinary peristalsis in these parts with increased downward pressure to reduce spontaneously the vast majority of what are probably not rare transient intussusceptions. Alvarez in cinematographic studies points out that transient intussusception of the small gut is a naturally occurring phenomenon, and in these areas where retrograde peristalsis occurs it is very likely that transient retrograde intussusceptions are not rare.

In a small percentage of these cases, however, distension of the proximal efferent loop and stomach may lead to anti-peristalsis in the latter organ, with vomiting and a relative lowering of pressure above the intussusception, and so further advancing it. As a secondary effect the intussusception acts as an obstruction to the small gut, and if the alimentary contents cannot pass distally the result is to stimulate and increase the reverse peristalsis (P. Thorek).

These factors of diminished pressure above, due to vomiting, plus increased retrograde peristalsis, would rapidly advance the intussusception until sufficient gut was herniated into the stomach to

4. And pushed upward by the antiperistaltic wave against the pressure from above.

fill that organ. With further intussusception the blood supply of the intussuscepted gut becomes occluded. First the venous return is affected with engorgement, congestion and resultant haemorrhage, so that the patient vomits fresh blood. The congestion makes spontaneous reduction much less likely to occur. When the arterial supply becomes affected the gut becomes gangrenous. Shock, toxæmia and death ensue unless the condition is dealt with in the early phase, usually within the first 48 hours.

The almost non-occurrence of retrograde intussusception in the absence of gastro-enterostomy stomata is due to the mechanical situation of many physiological junctions. The oesophagus is extra-peritoneal, its lower end is held by peritoneal folds, and the distal stomach is much wider than it. The duodenum is retro-peritoneal, and relatively immobile. The caecum is likewise fixed and wider than the terminal ileum. In the case of the gastro-enterostomy stoma, the gut below the junction is very mobile and of much smaller lumen than the stomach above it. However, there have been some rare and interesting cases recorded of non-reducing retrograde intussusceptions, in the absence of gastro-enterostomy stomata.

Lannon and Culliner report a case of retrograde

5. Vomiting V tends to release the pressure from above and to encourage antiperistalsis; obstruction O increases antiperistaltic motion upwards.

intussusception of the duodenum, pylorus and lesser curvature of the stomach well up into the thoracic oesophagus of a child.

R. Broglio reports a case of invagination of the duodenum into the stomach.

Ibos and Legrand Desmos report the case of a 23-year-old man who developed retrograde intussusception of the jejunum reaching up to the duodeno-jejunal flexure. The duodenum and stomach were dilated, the bowel collapsed.

Groper reports a case of retrograde intussusception of ileum into jejunum. This was successfully treated by resection.

E. E. Lewis reported a case of retrograde colocolic intussusception in which the apex of the sigmoid colon reached as far as the caecum.

In none of the above cases was there evidence of tumour or any other bowel pathology to suggest a cause of intussusception.

McNamara, 1944, reported the first case of retrograde jejunal intussusception through a subtotal gastrectomy stoma. The patient had previously had a gastro-enterostomy stoma and had developed retrograde gastro-jejunal intussuscep-

tion through it. This was treated by partial gastrectomy and a short time later retrograde intussusception recurred. In this case the efferent loop again was the intussuscepting one while the afferent loop and the stomach were distended.

At this point it should be stressed that retrograde intussusception of the efferent loop is a rare condition, and any explanation of its mechanism must take cognizance of this fact. Retrograde peristalsis is much less common than iso-peristalsis in the efferent loop. The presence of even transient intussusception at the site of retrograde peristalsis is probably not common and the vast majority of these are spontaneously reduced. This would account for the rarity of the condition. If the absence of sphincter at the gastro-enterostomy were an important factor one would expect this condition to be much more common than it actually is.

Summary

1. Retrograde intussusception of the efferent loop of a gastro-enterostomy is a well-recognized, although infrequent condition. No previous attempt has been made to explain its mechanism.

2. Another case has been reported—this time of a thrice-occurring retrograde intussusception which was successfully treated surgically.

3. A theory to explain the mechanism of retrograde intussusception through a gastro-enterostomy stoma is put forward.

4. Some rare and interesting cases of retrograde intussusception without gastro-enterostomy are reviewed.

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RECURRENT RETROGRADE GASTRO-JEJUNAL INTUSSUSCEPTION

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Since 1917, when the first case of retrograde gastro-jejunal intussusception was published (Steber, 1917), many cases have been recorded. However, only one other case of recurrent retrograde gastro-jejunal intussusception has been reported (Baumann, 1921). Therefore the following case is of special interest.

Case Report

History. A female, aged 47, was admitted to the Manchester Royal Infirmary on April 18, 1952, with symptoms of a duodenal ulcer. Barium meal confirmed the clinical diagnosis. Operation was performed the following day. An ulcer was found in the first part of the duodenum, which was producing some degree of stenosis. A fractional

gastric analysis had shown a low acid curve. A posterior gastro-enterostomy was performed.

The patient made an uninterrupted recovery and was discharged home on May 1, 1952.

On July 8, 1952, the patient was re-admitted with a history that she had been quite well until the day before, when she was awakened at night with a heavy gnawing pain in the epigastrium. The pain was constant and continued to increase in severity. Vomiting commenced soon after the onset of pain. Vomiting relieved the pain and was profuse and blackish-brown in appearance. It was effortless and smelt foul. She had nothing to eat all day and had no bowel action.

On admission there was some degree of abdominal distension with guarding and tender-