The Surgical Treatment of Congenital Hypertrophic Stenosis of the Pylorus

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Outside War medicine and surgery, no one subject has received more notice of recent years in medical literature, and especially in American surgical journals, than the pyloric stenosis of infants. Scores of papers have appeared. Much speculation as to etiology and pathology has been indulged in, and a cloud of controversial dust has been raised in discussions upon the treatment.

It was an Englishman named Armstrong who, over 140 years ago, first described a peculiar condition of the pylorus in an infant. He concluded, after a post-mortem examination, that his patient died of a spasm of the pylorus. Ten years later, Beardsley, in America, reported a case of scirrhus of the pylorus, which Osler, in 1903, baptised into the name of Congenital Hypertrophic Stenosis of the Pylorus.

Out of the welter of discussion certain facts are at last emerging, and a definite line of treatment bids fair to become accepted by the profession generally. Just as the adoption of appendectomy, twenty years ago, helped to sheet home the blame for various forms of typhilitis, so surgical intervention is rapidly elucidating the real nature of this form of pyloric obstruction. Some years ago confusion of thought was largely the result of efforts at classification, and especially the attempt to draw a hard and fast line between hyperplasia and spasm. The fact appears to be that all these cases have hyperplasia in varying degree, and that spasm is frequently the factor which determines the obstruction. Where hyperplasia is slight and spasm can be controlled by medical treatment, the patient may be tided over a critical period of weeks of months till the growing stomach provides a large enough channel of exit for nourishment to reach the mucous membrane of the intestine. But the one safe therapeutic guide is to view the condition as one of obstruction, varying in degree but always dangerous. Anyone who has seen and handled these pylori needs no argument to convince him of that fact. Where the obstruction is severe, the mortality is enormous.

I need not linger over the symptoms and signs of this condition, as they are now familiar. The diagnosis is usually easy, and fewer deaths from stenosis are now certified as marasmus or inanition. The picture is that of obstruction, and all cases of intestinal obstruction bear strong family resemblance. “The undiscovered tidings in his breast suffer him not to rest.” Suffice to say that every infant, a few weeks old, who develops projectile vomiting should be carefully watched and treated. Medical treatment by lavage and atropine may possibly tide the patient, “mewling and puking in his nurse’s arms,” over the critical period. But is a mother describes starvation stools, almost dry napkins, and increasing emaciation, it is time to expect the characteristic bulging epigastrium, where visible peristalsis is always seen and a tumour is often felt.

In short, if explosive vomiting is intractable in spite of stomach washing and regulated feeding, then the degree of obstruction is highly dangerous, and unless surgery can successfully intervene, the child’s “doom is writ.” Even Robert Hutchison, who cannot be regarded as partial to surgery, records that four out of every five cases at Great Ormonde Street Hospital died under medical treatment.

The pertinent question now is, does surgery offer a reasonable chance of recovery for such cases? The answer is that the chances of success are increasingly good, and chiefly on account of the more general adoption of that simple form of pyloroplasty
which has been gradually evolved by quite a number of operators, and has lately been named “Rammstedt’s operation.”

Now that some thousands of cases of infantile stenosis have been operated upon, and as many as 100 cases have been recorded by one surgeon, some consensus of opinion might be expected on the subject. Gastro-enterostomy has afforded quite a large number of successful results; various modifications of pyloroplasty have been tried out; even pylorectomy has been ventured upon; Nicoll’s Y-shaped plastic operation was once popular, and Strauss has more recently devised an attractive pyloroplasty. It is highly probable that the final word has not yet been spoken as to detail, but it may safely be said that at the present moment one operation, that named “Rammstedt’s,” is to be preferred to all others for its safety and efficacy.

What is more to our immediate purpose, the opinion of surgeons of large experience can now be endorsed by those of small experience, and we can assure the parents of these children that a large majority of severe cases which would otherwise die can be saved by a timely operation.

Up to last year six cases have been operated upon in Oamaru, in two of which my colleague, Dr. Hargreaves, was the operator, and I have his permission to include them in this list. All were successful, though some were desperate cases, and all the children are now alive and well. In each case pyloroplasty was the operation performed, though the simple “Rammstedt” procedure was only adopted in the last two.

A few practical points may be of value, as we have learned them from experience.

The most important points in technique are, first, to render the operation safe by avoiding the opening of the mucous membrane at the duodenal end of the incision; and, second, to make the operation effectual by seeing that the muscle is entirely divided, especially at the stomach end. One must remember that the stomach projects into the duodenum much as the cervix uteri projects into the vagina, and that the muscle and mucous membrane are most intimately adherent at the duodenal end. The tumour is held between the fingers and thumb of the left hand, and a line chosen on the serous membrane of the anterior wall of the tumour as free from obvious minute vessels as possible. A shallow longitudinal incision is then made along this line with a sharp knife. The incision is now deepened by a blunt instrument. We find that the blunt end of the scalpel suits well. Thus the circular muscular fibres, cheese-like in consistency, are divided down to the mucous membrane without penetrating that structure. Any evident bleeding point is pinched with fine artery forceps, and no ligatures may be required. This completes the operation expect for the closing of the abdominal wall.

No operations in surgery yield such satisfactory results as those which relieve mechanical obstruction, but here, as in prostatectomy and other similar conditions, the final results is largely influenced by the after treatment. Personal supervision and intelligent nursing are of prime importance. Retention of warmth is essential. In all our cases we have seen that liquid is absorbed per rectum at the average rate of one ounce per hour. These children are dehydrated and their tissues are wilted for want of water. Liquid per rectum before operation is often advantageous. After operation we aim at one ounce of normal saline and one ounce of sugar of milk solution (two drachms to the pint) alternately every hour for the first 24 hours, and then continue at longer intervals according to the state of the child and its ability to retain nourishment by the stomach. By the second day the child can usually retain diluted breast-milk given with pipette in gradually increasing quantities, beginning with one drachm. In a weaned child we begin with sugar of milk solution, followed by dilute humanised milk.

It is hard to withstand the allurements of speculation as to the etiology and pathology of this extraordinarily interesting condition. A fair amount of experimental investigation is now forthcoming, and many illuminating facts are on record. For example, the typical hyperplastic condition has been found in a fœtus of seven months. Again, in children who have died of intercurrent affections, many months after gastro-enterostomy had been successfully performed for the stenosis, the thickening of the pylorus was as great as at the time of operation, and the canal was impervious to the passage of water, or admitted only a fine probe.
There is a considerable class of young adults who have suffered all their lives from gastric symptoms, indicative of a narrow pylorus, without signs of ulceration, syphilitic fibrosis, or other adequate cause of stenosis. They may have died of phthisis later on, and it is often assumed that a tubercular diathesis had been the cause of their chronically ill-nourished condition. Is it possible that a persistent infantile stenosis is sometimes the basal cause, and that the inroads of tuberculosis follow upon inadequacy of nourishment? Many years ago I did a gastro-enterostomy and stitching-up of the lesser omentum upon a young woman of 30 whose weight varied from 4st. 12lb. to 5st. 2lb., and whose stomach was much dilated and proposed. She improved after the operation, but died several years later from phthisis. I obtained the stomach post-mortem, and it shows a patent but narrow pylorus without any sign of a lesion to account for it, and a good functioning anastomotic opening.

The most attractive theory relating to the etiology and pathology of infantile stenosis is contained in articles by Pirie and Tyrrell Gray in the “Lancet” of September, 1919. It is there suggested that spasm inducing the hyperplasia is primarily due to anti-natal hyperadrenalism, and that other subsidiary post-natal causes determine the persistence and recurrence of the spasms. Want of balance between the hormones of the various endocrine organs is a fascinating field for speculation upon the problems of Medicine. There are several reasons for thinking that pancreatic insufficiency may be a factor in inducing spasm, once the hyperplasia is established.

Case 1.—July, 1914. Male Child; first; premature; weight at birth 5lb. 7oz. Characteristic symptoms of pyloric obstruction appeared somewhat suddenly. Medical treatment, continued for a week, proved unavailing. There was visible peristalsis with palpable tumour. Bowel movements ceased, and there was almost complete anuria. The child presented a shrivelled appearance and sometimes became leaden-coloured, so that the nurse more than once thought he was dead.

The condition appearing desperate, operation was performed at 8.20 p.m. under ether, after thorough stomach lavage with sterile water. The pyloric tumour was the size of a small walnut. It was incised longitudinally on the anterior surface down to the mucous membrane, two small bleeding points being crushed with fine forceps. A small separate opening was made on the anterior surface of the stomach, and by means of this opening fine dressing forceps were pushed through the pylorus. Following this a No. 12 soft rubber catheter was similarly passed through the pylorus well into the duodenum, and five ounces of sugar of milk solution (two drachms to the pint) was injected into the intestine.

The mucous membrane at the pylorus remained intact. A partially successful attempt was then made to transform the longitudinal incision in the pyloric muscle into a transverse one by means of mattress and simple interrupted sutures of linen thread. The small separate opening in the stomach was closed with Lambert stitches of catgut and thread. The abdominal wall was closed with No. 1 catgut and silkworm gut.

Strict care was taken throughout to retain warmth, the child being wrapped in cotton-wool. One ounce of rectal saline per hour was given for 24 hours. Twelve hours after the operation diluted breast-milk administered by pipette was rejected. Urine, however, was now passed and there was a bowel motion. After the first 24 hours the child began to retain sugar of milk solution by the mouth, and salines were given at gradually increased intervals. After 48 hours diluted breast-milk was retained, and from that time, by dint of cautious strengthening of nourishment, convalescence was uninterrupted. In a week's time normal breast-feeding was established, and the child gained weight steadily. This boy at six years is a sturdy, normal specimen of humanity.

Case 2.—1915, Male; first child; ten weeks; breast-fed. Nutrition poor from birth. Supplementary feeding by means of humanised milk. Inclination to vomit after a few weeks. Gradually failure of nutrition appeared and retention of food in the stomach. Treatment by lavage was begun and persevered with, but signs of obstruction slowly increased with visible peristalsis. Finally food was found to be retained in the stomach for ten hours.

At operation a large hard, nut-like pylorus was found. Simple pyloroplasty was performed, the pyloric tube being opened by a longitudinal incision. Some attempt was made to shell out the tube of mucous
membrane, and the opening therein was stitched transversely with a fine catgut. The muscle was then drawn together transversely by fine thread with difficulty, owing to the thread cutting through the cheese-like muscle. The infant made a slow recovery, but finally satisfactory nutrition was established, and the child has since gone through the gamut of children's diseases, ending up with diphtheria, which all but proved fatal. Tracheotomy, however, cheated pathological science of an opportunity of viewing, post-mortem, a cured case of pyloric stenosis, and the boy is now healthy and well.

Case 3.—1916. Male; eight weeks; second child; breast-fed. Weight at birth 8lb. 4oz. At end of first month 10lb. Then symptoms of obstruction. First, constipation and occasional vomiting. Finally, at the eight week, in spite of treatment, there was progressive loss of weight, projectile vomiting, visible peristalsis, diminished urine, and cold extremities.

Upon opening the abdomen a tumour like an acorn was found. A longitudinal incision was made down to mucous membrane, but at the duodenal end, where the muscle seemed to vanish suddenly contrasted with its hypertrophied state at the stomach end, I unintentionally opened the mucous membrane. In order to close the opening satisfactorily, a small incision was made in the anterior wall of the stomach some distance away, and by means of that opening a No. 7 rubber catheter was passed through the pylorus into the duodenum. Incidentally, use was made of this means to run three ounces of sugar of milk solution into the intestine, and the pyloric mucous membrane was accurately stitched with fine catgut over the catheter. The small hole in the stomach was then closed, and again, as in other cases, an attempt was made to draw together the pyloric muscle in a transverse direction. This closure, as previously, was unsatisfying owing to the pouting of the muscular incision. Therefore, finally, omentum was stitched over it. The child's convalescence was satisfactory. One ounce of saline and one ounce of sugar of milk solution was given alternatively per rectum every hour, and in the evening of the first day the pink appearance and occasional strong cry added hope to the prognosis. Breast-feeding was established in less than a week, and the child gained weight steadily and rapidly, week by week, till at the end of three months he was 16lb., and at 12 months of age 25lb. He is now a well-developed, healthy boy.

Case 4.—1917. Female; three months; first child; weight at birth 9lb. Breast-fed for a fortnight; afterwards humanised milk. Inclined to constipation and occasional vomiting from birth. In spite of constant case, no steady progress made. Later, symptoms and signs of obstruction were apparent. Weight at operation 7lb. 14oz. At operation a prick was again unintentionally made in the mucous membrane at the duodenal end of the pyloric incision. Therefore, after drawing together the hypertrophied muscle transversely, a piece of omentum was stitched over the incision. Convalescence was good. The infant did not vomit once after operation. Gain in weight has been steady, and the girl is now healthy.

Case V.—1917. Female; first child; five weeks. Patient normal at birth, became extremely emaciated, with obvious signs of pyloric obstruction. Milk was retained in the stomach of 12 hours before being syphoned out. At operation the mucous membrane was not opened. Convalescence was rapid, and the patient developed into a healthy child.

Case 6.—1919. Female; first child; three weeks; breast-fed. Symptoms of obstruction began at a fortnight. Explosive type of vomiting. Visible peristalsis. Palpable tumour. Napkins show only a damp, brick-dust-strained spot. No bowel motion for 48 hours. At operation the mucous membrane was not opened; no attempt was made to stitch the muscle, and no catgut whatever was left in the abdominal cavity. The child retained salines well. There was occasional vomiting during the re-establishment of breast-feeding, but gain in weight continued steadily, and the child became quite healthy.

Only two other cases of well-marked pyloric stenosis in infants were seen during the above period. In both cases medical treatment was persevered with, operation was declined, and a fatal result ensued.

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