at the end of 24 hours and at the end of a week; there was possibly a little hyperemia produced by both operations and possibly a little more produced by the inflation of air than by simple laparotomy, but nothing striking with either, which leaves the situation largely an empirical procedure. If there is benefit, and I think there is benefit with both procedures, we don't know why it is produced or what causes the benefit.

INTUSSUSCEPTION—THE CLINICAL MANIFESTATIONS.*

By JAMES S. STONE, M.D., BOSTON.

INTUSSUSCEPTION is the most terrible abdominal surgical emergency of infancy. My purpose is to call attention to the clinical manifestations of the condition which I am sure are not as fully and generally understood as they should be. For otherwise the patients would not, as is now so often the case, reach the hands of the surgeon too late for help. The monograph of eighty pages written by Charles P. B. Clubbe, of Sydney, N. S. W., some years ago, and just reissued by the Oxford University Press in a second edition, ought to be read and re-read by every physician and surgeon. He gives a clearer description than any other writer.

The symptoms are characteristic. Pain accompanied by shock is invariably the first symptom of intussusception. The pain is paroxysmal and gripping in character. It occurs only during the periods of peristaltic action. Between the periods of contraction of the muscular wall of the bowel, the child may often quietly drop off to sleep. The intervals of comfort vary in length very considerably, from a few minutes up to half an hour. But when the spasmodic peristaltic action comes on, the violent contraction and the pulling and squeezing of the bowel produce definite symptoms of shock. Pallor, cold sweat, and often reflex vomiting, occur during the periods of contraction. Clubbe rightly emphasizes most strongly the importance of these symptoms and points out that it is these symptoms which alarm the mother and which the physician must not ignore. The child may often have had ordinary cramps and colics. The mother is alarmed because the cramplike attacks of pain are accompanied by the definite symptoms of shock. Never, as Clubbe warns, is the story of the mother to be disregarded.

The next symptom is the appearance of mucus in the stools. This usually comes fairly promptly because of the active peristalsis and the fact that the trouble is generally located in the large bowel. But the mucus appears only after any faecal matter in the large bowel has been discharged, although, of course, it may come at the end of an otherwise normal faecal movement. The mucus is due entirely to the congestion of the intussuscepted bowel. As the bowel is in-

verted, the mesentery is dragged in also, and becomes pinched when it enters the ring of the receiving bowel. As more and more mesentery is drawn in, the pinching becomes more marked and the venous return from the bowel is cut off. The mucus becomes blood stained. As the passive congestion increases, practically pure blood is poured out into the lower bowel. The rapidity with which there is a change in the movements from mucus to blood stained mucus, and then to blood, depends entirely on the rapidity with which more and more bowel and mesentery become involved.

The symptoms so far mentioned are due solely to the intussusception. Those which follow are due to intestinal obstruction.

The first of these is again vomiting. But the vomiting is not the reflex vomiting noted at first. It is that due to obstruction and soon becomes faecal in character, till finally the child spits out of the corner of the mouth the dark faecal fluids.

The toxæmia due to absorption is the next symptom, and in infants this condition often comes on with appalling rapidity and severity.

Distension may or may not be present. Often the distension is slight owing to the amount of vomiting. At times it is considerable.

There are thus these symptoms in order:

1. Recurring attacks of pain associated with pallor, cold sweat, and reflex nausea or vomiting.
2. Mucus, blood stained mucus, and blood in the movements.
3. Obstructive vomiting.
4. The toxæmia due to obstruction.

The diagnosis can be made from these symptoms alone. The finding of the tumor on abdominal examination confirms the diagnosis. Fortunately, the tumor can usually be felt with the greatest ease, but occasionally it is concealed behind distended loops of small bowel. There is one other matter of the utmost importance regarding the tumor. The trouble usually begins at the ileo-caecal valve. The tumor, therefore, at the very onset is in the right iliac fossa. But very soon the advancing mass is under the liver at the hepatic flexure of the colon where it may be felt at times only with great difficulty because it is as yet relatively small and deeply situated. If the true condition is overlooked at this stage the chance of cure is decreased tremendously. And at this early stage it seems as if the tumor must be often overlooked because of the altogether too common delay in diagnosis. Once again remember the advice of Clubbe, to examine under an anaesthetic, if necessary, to make certain of the presence or absence of the tumor beneath the liver in those cases in which the other symptoms are characteristic.

Later in the course of the disease, the tumor moves over toward the spleen and later still lower in the left abdomen.

In no disease are the symptoms more definite

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and in no disease is the need of instant surgical intervention more plain. Yet, in spite of this, the cases are sent to the hospitals late, and in Boston they are not sent to the hospitals in the numbers which might be expected if no cases died unrecognized.

The probable reasons for failure to recognize the disease promptly lie first in the fact that the early pain comes on only at intervals, and, second, that the early tumor is hidden by the liver. We must remember always that early in the disease the characteristic symptoms occur only during the paroxysms of peristaltic contraction. When the complete picture of intussusception with obstruction is present, the time for successful surgery has often gone.

The rapidity with which the disease may progress is sometimes appalling. I can never forget a baby, of about a year, in whom the tumor reached from the ileo-caecal valve to the rectum, and became absolutely irreducible within six hours after the onset of the first symptoms.

The large majority of cases of intussusception begin by the passage of the lower ileum through the ileo-caecal valve. This makes a tumor within the caecum which peristaltic action very promptly pushes along through the ascending, transverse and descending colon, forming a tumor commonly described as sausage shaped. The description may be correct if a curled up sausage is in mind.

In some instances, however, the trouble originates in other portions of the bowels. Next in frequency to the origin at the ileo-caecal valve is an origin in the lower ileum near the region of Peyer's patches or at the location of a Meckel's diverticulum. Not infrequently a Meckel's diverticulum the size of a small thimble may turn inside out and enter the bowel, causing the nucleus of the intussusception. In some instances a polyp in the lower ileum, apparently at the location where Meckel's diverticulum had been, becomes the origin of the intussusception. Possibly, swelling of lymphoid tissue in the lower ileum may be a causative factor.

Occasionally, without clear mechanical cause, the trouble originates higher in the small or lower in the large bowel. The possibility of an apparent prolapse of the rectum being in reality an intussusception originating in the sigmoid must always be kept in mind.

In the matter of treatment I will mention only a few points. No other than operative treatment is for a moment to be considered. While an exceptional case may be cured by enemata, just as a few cases recover spontaneously, the delay and shock and uncertainty of such procedures condemn them absolutely.

No matter how far to the left side the tumor may be felt, the incision must never be to the left of the midline and usually may well be to the right because the greatest difficulty in reduction will almost certainly be in the region

of the caecum. Reduction by taxis as far as possible is the first step. There may be difficulty at the splenic and perhaps at the hepatic flexures.

The real problem comes toward the end. The swelling and oedema of the bowel will frequently cause an interlocking of the various portions, making reduction difficult and at times impossible. If under these conditions the bowel is still viable, every reasonable effort at reduction must be made even at the expense of some tearing of the sero-muscular layers. What would under ordinary conditions be regarded as unjustifiable force may be necessary, but there must be no roughness in manipulation.

Of course, if the bowel is gangrenous or if reduction is impossible, immediate resection is the only thing. The risk of resection is great but in the literature Clubbe has collected, there are sixteen instances in which an infant has survived resection. At the Children's Hospital there have been no such recoveries, though some have seemed hopeful at first. The case reported by Dowd, of New York, of a baby five days old, is the most remarkable.

After resection, anastomosis is necessarily a time consuming procedure. Enterostomy is, of course, much quicker and in adult surgery would doubtless be a preferable procedure. But it must always be remembered that in a baby an enterostomy is a very serious matter. The very active peristalsis, and the absolute lack of control in crying and straining, practically always lead to a prolapse of the bowel. This condition combined with the consequent irritation of the adjacent skin and the interference with nutrition, leads nowhere. In babies, therefore, enterostomy is to be avoided if possible, and wherever possible an anastomosis done.

It may seem unnecessary to say anything about closing an abdominal wound. But in babies this must be done with the utmost care. Two cases of intussusception at the Children's Hospital have been lost as a result of a giving way of the wound, one on the fourth and one on the tenth day. These two experiences, together with others in different conditions, justify a word of warning.

The temptation is to close the abdomen as rapidly and simply as possible. But in babies it is never safe to do anything else than close the wound in layers. They cry and strain without any control. The abdominal wall is often so thin that peritoneum may very readily be rolled in between the layers of muscle and fascia, and thus prevent any possible union of the structures which we must depend upon for proper support.

One other matter—the appendix, the ileo-caecal valve, the various folds of serous membrane in this region are practically always involved in the intussusception. The temptation is often strong to remove the appendix, and in other ways to improve on nature. We are apt to

forget that the resisting power of the normal peritoneum is what saves use from trouble in the vast bulk of abdominal surgery. Remember that we are dealing with damaged peritoneum, and do not be tempted to do anything more than cure the one single condition which demands treatment. Other surgical refinements can perfectly well be done later on a living child.

ACUTE INTUSSUSCEPTION. SURGICAL TREATMENT AND REPORT OF CASES.

By F. V. HUSSEY, M.D., PROVIDENCE, R. I.

As the principal purpose of this paper is to discuss the treatment of intussusception, it is not proposed to discuss in detail the causes and symptoms of that condition, as they have already been presented by Dr. Stone in a very thorough manner, but at the risk of trespassing on your patience for a few moments I would like to emphasize a few of the points already brought out to demonstrate the reason for the contention that the earliest possible operation is the method of choice in the treatment of intussusception, and that the results obtained are directly related to the length of time which intervenes between the onset of symptoms and operation.

As to the causes of intussusception, they may be classed as predisposing and actual. The predisposing causes are due to certain peculiarities which are found in the intestinal tract of the rapidly developing infant. The most important of these conditions are:

1. The greater mobility of the caecum and ileum due to a longer mesenteric attachment because of a lack of fusion between the two layers of mesentery which later in life occurs, and which fastens the colon, caecum and ileum to the posterior wall of the abdomen. This extreme mobility allows the ileum to fall into a nearly direct line with the long axis of the caecum and colon.

2. In the very young infant, the ileo-caecal valve is large, due most likely to the much more rapid development in size of the caecum over the ileum. This permits of an abnormally easy passage of the ileum through the ileo-caecal valve.

3. The pronounced thinness of the intestinal walls in infants.

Among the actual causes may be classed:

1. Those organic conditions such as intestinal polypi, Meckel's diverticulum, tumors of the walls of the intestines, *et cetera*, which in these cases form the apex of the intussusception.

2. An irregular muscular contraction of the intestinal wall which permits or causes the normal bowel below this contraction to turn up and fold over the point of contraction above. This is the beginning of the invagination which

continues as far as the length of the mesentery permits.

Now the pathology which results from invagination of one portion of the intestine into another, is due to interference with the blood supply of that section of the bowel through traction and pressure on the involved portion of the mesentery.

We have:

1. Swelling of the walls due to congestion and oedema, which causes the degree of obstruction present and bleeding into the lumen of the bowel.

2. If interference with the blood supply is sufficient, gangrene and sloughing occurs.

3. Adhesions due to local inflammatory processes occur between the walls of the intussusciens and intussusceptum which with the congestion and oedema produce irreducibility.

4. And finally the general condition of peritonitis supervenes. Thus we can see that early relief to the circulation of the segment of intestine involved will head off the later infinitely more serious complication which makes operative results so unsatisfactory.

I cannot refrain from speaking of one very important symptom which follows the sudden acute pain. Before bloody movements are passed, the patient nearly always has one or more stools of fairly normal appearance. In fact, in some of the cases to be presented later, bloody stools never occurred.

Treatment.

The opinions of men who have had the most experience is conclusive that there is no medical treatment for intussusception. Inflation with air and distention with water of the large bowel has been tried without uniform results; and these methods are looked upon with disfavor by most surgeons at the present time. These procedures are unscientific, in that accurate results cannot be obtained in the sense that a positive reduction of the intussusception is accomplished. In these cases which are reducible, the main difficulty occurs in reduction of the swollen and oedematous apex of the intussusception. In many instances where complete reduction has been thought to have been obtained, a reoccurrence of the invagination has taken place.

Mr. Eve of London, gives the following arguments against inflation and injection:

- I. These methods are rarely efficacious. In twenty-four cases which he cites in which this treatment was carried out, none was cured. Eighteen of them were subsequently operated upon.

- II. Injection or inflation were not infrequently followed by an illusory or partial reduction.

- III. Injection or inflation are haphazard and not without considerable danger. The chief danger of which, of course is the danger of rupture of the intestine.