ACUTE INTUSSUSCEPTION IN CHILDHOOD*

BY

R. B. ZACHARY

From the Children's Hospital, Sheffield

Although there are many aspects of intussusception which would well repay close consideration, there are two serious problems that frequently confront the children's surgeon—the management of a gangrenous intussusception and the role of conservative treatment.

In my experience death during or shortly after operative treatment of intussusception has usually been due to inadequate prevention or treatment of shock. Resuscitative measures have become such a routine and often successful procedure in the severely ill child that the mere institution of these measures may come to be regarded as adequate preparation for operation. A repeated assessment of the condition of a seriously ill child must be made by the surgeon, and it is important to resist the temptation to operate early for one's own convenience.

How long should resuscitative treatment be continued? If the infant improves rapidly there is no problem, but some will need three to six hours before they should be submitted to laparotomy. Still others, desperately ill, may not in fact show any clear sign of recovery and, in spite of this, they must be operated upon. I do not think a definite time limit should be placed on resuscitative treatment, but any worthwhile improvement will usually occur within the first six hours.

A second difficulty is to decide how long to spend on the attempt at reduction. Some surgeons would put a limit of 15 or 20 minutes. Although it is true that one may lose all sense of time during the uneasy persuasion of a recalcitrant intussusception, I think it is a mistake to limit the attempt by the clock but rather by the progress of reduction. There are times when it is apparent after three or four minutes that reduction is impossible. On other occasions a difficult reduction may take a long time but the bowel be found healthy on completion.

If it has been decided that an intussusception is irreducible, or if the bowel is found to be gan-

grenous after reduction, there is no doubt about the need for resection, but there is disagreement about operative technique.

It is sometimes said that the simplest and safest procedure is to suture the afferent and efferent loops of bowel together to make a spur and bring the mass out of the abdomen, where its removal leaves a double-barrelled enterostomy. While it is true that this can be done quickly, the post-operative course is by no means always smooth. In the first place the loss of a considerable volume of intestinal fluids may be an extremely grave matter even with careful fluid therapy and although the spur is crushed after three or four days. Moreover, the closure of the double-barrelled enterostomy is not without its own risks.

The second method is enterostomy with anastomosis, in which an anastomosis is made between the afferent and efferent loops at the time of the first operation. Another variation in this technique is to perform an anastomosis, perhaps an end-to-side or side-to-side anastomosis and lead a catheter from the proximal end through a stab wound as a safety measure.

The third type of procedure is a straight resection and anastomosis without any enterostomy as a safeguard. I think there are two important aspects in this operation. The first is that the resection should be generous and extend well beyond the oedematous bowel. The second point is the advantage of deflating the proximal bowel if it is grossly distended. My own preference is for the closed end-to-end anastomosis where this is possible, but I think it is sufficiently clear that the open anastomosis fails, when it does fail, not because of some incidental operative contamination of the abdominal cavity but because the technique of intestinal suture is at fault or the condition of the intestinal wall is poor.

My choice of technique for the gangrenous intussusception would be influenced by my assessment of the child's condition before operation and the advice of the anaesthetist about his progress or deterioration during the procedure. Were I not satisfied that the patient was reasonably fit I would

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bring out the affected loop and remove it when the abdomen was closed. In other cases resection and end-to-end anastomosis is preferred.

The second important problem in the management of intussusception is the vexed question of conservative treatment. Ever since Jonathan Hutchinson in 1871 first reduced by operation an intussusception in a child there has been a strong tradition of operative treatment in this country and in America. At the same time as Hutchinson (1874) reported his success, Hirschsprung in Copenhagen was systematically treating all cases by an enema coupled with manipulation through the abdominal wall, and by 1905 he was able to present 107 cases treated in this way. In Australia, Clubbe (1921) was most insistent that 'the treatment of intussusception is laparotomy', but when the patient was on the operating table under anaesthesia he always tried an olive oil enema. In 140 cases, 10% were reduced and in many more the apex was pushed back as far as the caecum. The lead that Clubbe had given in Australia was followed there by Hipsley, who in 1926 published a report of 100 cases in which a saline enema was used on the operating table. He claimed to assess reduction by measuring the girth of the abdomen after evacuating the enema. If it had increased there must be fluid in the small bowel and the intussusception was reduced. He reported 62 out of 100 reduced in this way.

The non-operative procedure received a great stimulus in 1927, when George Retan in America described the use of the barium enema in reducing an intussusception. His suggestion was taken up with enthusiasm in Scandinavia, where Nordentoft (1943) in Denmark reported 440 cases in which 31% were reduced. In Sweden Hellmer published his experiences in 1948, in which he claimed that in a series of 162 cases, 80% of the intussusceptions were reduced.

Criticisms of Conservative Treatment

I had given little consideration to the conservative approach to intussusception, nor was I tempted to try it after reading the paper of Ravitch and McCune (1948a) in which the results of operative and conservative treatment were compared. The fallacy of this comparison had been recognized by Hutchinson, who wrote:

'It is absurd to institute any comparison between the treatment by injection and that by laparotomy. Statistical tables indicating a contrast as regards the relative success of the two measures are a mere waste of labour.'

However, I was encouraged to give the methods a trial as a result of a very reasoned reply which I had

received from T. Y. Nelson of Sydney, after I had criticized his paper in *The Medical Journal of Australia* (1949). The criticisms of the conservative treatment which have been levelled from time to time fall under six headings: (1) Delay, (2) perforation, (3) uncertainty of reduction, (4) missing a high intussusception, (5) missing a causative lesion, and (6) a high rate of recurrence.

Delay. It is said that delay before operation entailed by the attempt to reduce the intussusception with barium enema is serious and, moreover, that the procedure itself is shocking. However, provided the facilities and staff are available, the attempt can be completed within an hour of admission to hospital, by which time the pre-operative atropine has become effective. Also one of the difficulties about the conservative method is that when the intussusception has been reduced as far as the caecum the child may seem somewhat better and the surgeon must not be deceived by the improvement in general condition into thinking that reduction is complete. If the attempt were made, and I do not advocate it, in the seriously ill child it might well be that the child's condition would be worse, not as a result of the delay, but because of the failure to apply resuscitative measures.

Danger of Perforation. Several cases of perforation have been recorded, but all that I have heard of have been late cases. In one of their papers Ravitch and McCune (1948b) described some experiments in which they showed that in dogs a pressure of three feet of water was unable to cause perforation in a gangrenous intussusception and provided the pressure is kept no higher than this, the chances of perforation appear minimal. If perforation does occur, in the words of Nyborg (1943) 'the prognosis is pessima'.

Uncertainty of Reduction. The certain sign of reduction is to observe the barium pass high up into the small bowel under the fluorescent screen, but it cannot always be persuaded to pass beyond the ileocaecal valve. In such cases, the complete filling of the caecum and the absence of a mass on palpation after evacuation have been accepted as reasonable security. If doubt exists about the reduction the abdomen must be opened.

High, Purely Ileal Intussusception. The criticism that a high, purely ileal intussusception may be missed is based on a misconception of the purpose of the barium enema in intussusception. It is not intended as a diagnostic measure. If the clinical diagnosis is intestinal obstruction due to intussus-

ception and a barium enema fails to show the intussusception the abdomen must be opened.

Missing a Causative Lesion. Lesions such as a polyp, Meckel's diverticulum, tumour or enterogenous cyst may be the leading point of an intussusception and at operation they can usually be recognized and dealt with at the time if the conditions are favourable, or removed later. It is true that a lesion of this sort might be missed with reduction by means of a barium enema and on this score the criticism cannot be adequately answered.

High Rate of Recurrence. The usual figures given for recurrence in intussusception following operation are somewhere between 2 and 5%. After conservative reduction it is said to be high, and Hellmer, in his series of 162 cases, reported a remarkably high incidence of 16%. In my own small series I have not been able to confirm this high incidence. If there is recurrence it is likely to be recognized easily and early and the case can again be submitted to a barium enema.

Technique

The two opposing views in the past have been,

first that operation should be undertaken at once if the child is fit, and secondly that every case should have an attempted reduction with a barium enema. It seemed to me possible that the truth might lie somewhere between these two extremes and that a further study of the problem was justified.

In view of the criticisms a determined attempt was made to avoid as many pitfalls as possible and yet, at the same time, maintain simplicity. The house officers were given some rules to avoid the dangers of delay and shock and the child was always given pre-medication with atropine so that he would be ready for the theatre if necessary, and rectal thiopentone sodium was given as a sedative. The barium was warm and a douche can was held in the hand so that the pressure could not be too great. The buttocks were held by a volunteer and the barium run in slowly.

The intussusception may be met in the descending colon and pushed back as far as the transverse colon but no further (Fig. 1). On the other hand it may be completely reduced and the barium flow high into the small bowel (Fig. 2). Finally, it may pass as far as the caecum and a filling defect be obvious (Fig. 3).

FIG. 1(a)—The barium enema has outlined the intussusception in the descending colon.

FIG. 1(b)—Reduction took place as far as the transverse colon but no further.

FIG. 2(a)—The intussusception was outlined by the barium enema in the transverse colon.

FIG. 2(b)—Barium has passed high up into the small bowel and the intussusception is reduced.

FIG. 3.—Reduction as far as the caecum but filling defect still present.

Results

In 54 cases there was an attempt at reduction with barium enema and in 33 it was successful. Among the factors which might be influencing the success or failure of the procedure delay before admission to hospital seemed the most likely. When the delay was less than 24 hours, 28 out of 40 were reduced (70%), whereas when the delay was more than 24 hours, only three out of 12 (25%) were reduced, excluding two cases in which the intussusception had been present for more than a week in older patients who were not acutely ill.

It also seemed possible that the intussusception would be tighter in a young child, simply because the bowel was smaller. Among children of less than 6 months of age only five out of 15 (33%) were reduced, whereas in those more than 6 months of age 28 out of 39 (72%) were reduced. If these two factors are combined it is found that among those children who are more than 6 months of age with a delay of less than 24 hours, 23 out of 28 intussusceptions were reduced, approximately 82%. These results can be represented graphically (Fig. 4).

FIG. 4.—Chart to show influence of time and age factors.

R = Intussusceptions reduced by barium enema.

U = Intussusceptions not reduced by barium enema.

R' = Chronic case—delay more than one week.

< 6 M., > 6 M. = Age less than or more than 6 months.

< 24 H., > 24 H. = Delay less than or more than 24 hours.

Conclusions

With selection of cases, successful reduction of intussusception with barium enema can be achieved in a high proportion.

If the technique is restricted to those admitted within the first 24 hours there is little danger.

Perhaps most important of all, the procedure should be in responsible hands and the child must be under the direct care of the surgeon who may have to operate.

Summary

The infant with a gangrenous intussusception needs adequate resuscitative treatment before and during operation. For the experienced surgeon the treatment of choice will be resection and anastomosis if the child is fit, or a double-barrelled enterostomy if his condition is desperate. Conservative treatment has a place in the management of the early case provided that adequate facilities and experienced staff are available.

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