

Sands (H. B.)

ON THE  
TREATMENT OF INTUSSUSCEPTION

BY

ABDOMINAL SECTION,

WITH THE REPORT OF A CASE IN WHICH THE  
OPERATION PROVED SUCCESSFUL.

BY

H. B. SANDS, M. D.,

PROFESSOR OF ANATOMY IN THE COLLEGE OF PHYSICIANS AND SURGEONS; ATTENDING  
SURGEON TO THE ROOSEVELT AND NEW YORK HOSPITALS, ETC.

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AT 6 P. M. on Sunday, March 11, 1877, I was called to see Mary L., an infant six months old, who, while nursing twelve hours previously, had been suddenly attacked with tenesmus and abdominal pain. Soon afterward vomiting set in, and continued during the day whenever the child was nursed or fed. Meanwhile, the straining action became more violent, and was attended with an escape of bloody mucus from the rectum. No feculent matter was contained in these evacuations, eight of which had occurred since they were first discovered at one o'clock. During the afternoon all the symptoms became aggravated, and the child seemed exceedingly ill. On my arrival I found the patient in great pain, and in a condition approaching collapse. The pulse was extremely weak and rapid, muscular debility marked, and tenesmus severe and frequent. From the history of the case, I at once suspected that the symptoms were due to intussusception, the presence of which I was able to confirm by manual examina-

<sup>1</sup> Read before the New York County Medical Society, May 28, 1877.

tion. On flexing the thighs and relaxing the abdominal muscles, an elongated tumor could be felt, extending in a straight line from the left iliac region to the left hypochondrium. The upper part of this tumor was movable, and could be pushed a little beyond the median line. It was tolerably firm and inelastic, tender on pressure, and dull on percussion. The abdomen was not tympanitic, and the detection of the tumor was quite easy. On inserting the finger into the rectum, the invaginated intestine was at once discovered, reaching down nearly to the anus, and forming a mass that filled the rectum completely. The lower orifice of the intussuscepted gut could be distinguished as a depression, situated somewhat laterally; and the finger, as high as it could reach, passed freely between the mucous membrane of the rectum and the invagination. Furthermore, by conjoined manipulation, with the finger of one hand in the rectum and with the other hand upon the abdomen, the continuity of the rectal and the abdominal tumor could be distinctly appreciated.

Having satisfied my mind regarding the diagnosis, I lost no time in endeavoring to replace the invaginated intestine, and succeeded, as I thought, in effecting partial reduction by simply pushing the rectal tumor upward with the finger. But the abdominal swelling was not materially altered by this manœuvre, and the intussusception soon reappeared in the rectum. I then tried to inflate the intestine; but, as the apparatus employed for this purpose was imperfect, and adequate assistance was wanting, I soon abandoned this method, and resorted to the injection of warm water. By compressing the nates, I succeeded in throwing up a considerable quantity of fluid, which caused the rectal tumor to disappear, and the abdominal one to become smaller. As these several manipulations had occasioned much pain, and as the child seemed quite feeble, I desisted from further attempt at reduction until ten o'clock in the evening, when, accompanied by Dr. J. G. Curtis, I returned to the patient, whom I found in the same condition as at the time of my first visit. The rectal tumor had again descended close to the anus, the abdominal swelling was plainly distinguishable, and the signs of obstruction were marked. In the interval between the first and second visits,

the muco-sanguinolent evacuations had continued, and the child had grown weaker. With Dr. Curtis's assistance, I inserted a flexible tube about six inches up the rectum, and practised inflation with the mouth. By this means I effected partial disinvagination; but, as the procedure occasioned great pain, and afforded only imperfect relief, I repeated it but two or three times before resorting to warm-water enemata. This time the water was injected through the long, flexible tube, inserted as above mentioned, and the distention thereby produced was evidently considerable, as was shown by the child's suffering, and by the force with which the fluid was expelled when the pressure was taken off the nates, and the tube withdrawn from the rectum. While the enemata were being administered, the child was held at times in the inverted position, and the abdomen was gently kneaded. Having pursued the treatment thus described as long as was deemed prudent, I noted the following result. The abdominal tumor had so far disappeared that it could no longer be discovered by palpation, nor could the invaginated gut now be found in the rectum. Nevertheless, by conjoined manipulation, I felt assured that a certain portion of intestine was yet unreduced, for I could distinctly make out the presence of a small but firm and movable swelling at the level of the umbilicus. Convinced that the case ought neither to be left to Nature, nor treated by medicine, and having obtained the consent of the parents to act according to my own judgment, I proceeded, without delay, to perform the operation of abdominal section, or laparotomy. Ether having been administered by Dr. Curtis, I opened the abdomen by an incision about two inches in length, extending downward from a point just below the umbilicus. By introducing two fingers through the wound, I was able to make the necessary exploration, and at the same time to prevent the escape of the small intestine. After a little delay, a tumor was discovered in the right iliac fossa, which afterward proved to be the intussuscepted mass. Finding it impossible to examine this satisfactorily without withdrawing it from the abdomen, I did so, after having necessarily permitted the escape of a large proportion of the small intestine. It was then apparent that the intussusception was

of that variety which Brinton has called ileo-cæcal, and that the invagination had been greatly reduced in size by the methods of inflation and injection. What remained, and constituted the mass exposed by dissection, was an intussusception of the cæcum and terminal portion of the ileum into the commencement of the ascending colon. The mass was about an inch and a half in length, and the inversion and swelling of the cæcum appeared to have produced complete obstruction of the ileo-cæcal valve. Although the intussuscepted part was short, I found considerable difficulty in extricating it, on account of the rigidity and swelling of the intestinal coats, which were dark colored and ecchymotic. Disinvagination was effected mainly by pulling the outer or ensheathing layer of the intestine downward, and by squeezing the lower end of the intussuscepted gut. Some force had to be employed at this stage of the operation, and it was feared that the intestine might be ruptured in the attempt to reduce it; but, with caution and perseverance, the parts were gradually unfolded, until finally the vermiform appendix was extruded, and the normal relations were fully reestablished. The ileo-cæcal valve, as felt through the intestinal walls, appeared somewhat thickened, and at first was thought to be the seat of a polypoid growth; but this impression was probably erroneous. There were no adhesions or signs of general peritonitis, and the thickening and ecchymosis of the intestinal walls were limited to the intussuscepted parts. The mass of large and small intestine that now lay outside the abdomen was gradually returned, and the wound closed with five silver sutures, embracing the peritonæum. Additional support was afforded by the use of adhesive plaster and a flannel bandage. The replacement of the small intestine was a difficult step in the operation, but was accomplished without resorting to undue violence.

The subsequent progress of the case was highly satisfactory. Pain, vomiting, tenesmus, and the discharge of bloody mucus, ceased immediately after the operation, and did not recur. During the first twenty-four hours there was slight nausea, probably due to ether. The bowels moved naturally on the second day. The shock following the operation was

not severe, but the infant was too weak to nurse before the fourth day. Meanwhile, it fed regularly, and took occasionally a drop of laudanum, or a little brandy-and-water. Beyond this, no medicine was given. On the fifth day two of the silver sutures were removed; but, as the wound was not firmly united, the rest were allowed to remain, and were not all removed until the fourteenth day. At the first dressing the child struggled violently, and some gaping took place of the central portion of the wound. This occurrence, it was feared, would prove unfortunate, but no harm resulted, and recovery took place without the slightest symptoms of peritonitis. At the present date the child is in excellent health, and the cicatrix is quite firm.

Perhaps there is no situation more trying to the surgeon than that in which he finds himself placed when called upon to decide the question of performing the operation of abdominal section for the relief of intestinal obstruction. Confronted by the uncertainties of diagnosis on the one hand, and by the perils of the operation on the other, he may well be pardoned if he should err on the side of timidity, and hesitate to resort to the knife without further light and hope to guide him. It is not strange, therefore, that the operation has been but seldom attempted, and that the general verdict of the profession has been opposed to its performance.

But in recent times a change of opinion appears to have taken place; and, encouraged by the favorable results of ovariectomy, surgeons have been led to regard abdominal section as a safer operation than it was formerly considered, and as a preferable alternative, in many cases of intestinal obstruction, to the abandonment of the disease to its natural and generally fatal course. In England, a few years ago, Mr. Jonathan Hutchinson<sup>1</sup> reported the first successful case in that country of the treatment of intussusception by abdominal section, and in an able paper discussed the merits of the operation. The interest thereby awakened has caused Mr. Hutchinson's example to be followed by several other English surgeons, and facts are gradually accumulating which will enable

<sup>1</sup> "Medico-Chirurgical Transactions," vol. lvii., 1874.

us to decide many important points that can be settled only by experience. In recording the case I have narrated—which differs in some respects from all those hitherto reported—it may not be inappropriate to consider the treatment of intussusception, and to determine the relative value of operative procedures in the light of our present knowledge. The materials, it is true, are yet scanty, but they are sufficient to settle some points that have excited considerable controversy, and to indicate the direction in which future inquiries should be made.

As important preliminaries to the question of treatment, certain facts should be borne in mind respecting the pathology of intussusception. These have been well presented in a statistical paper by Leichtenstern,<sup>1</sup> of Tübingen, who has collected no fewer than five hundred and ninety-three cases of this disease. Disregarding those invaginations so often met with at the autopsies of infants, which are believed to occur during the last moments of life, and to be unattended with symptoms, and taking into account only those intussusceptions which are accompanied with more or less of intestinal obstruction, or with inflammation, we find the disease, although not confined to any age, to be most frequent during the first year of life. Brinton, Rogers, and others, have described the anatomy of intussusception, and the following varieties of the affection have been recognized according to situation :

1. Invagination of the small intestine.

2. Invagination of the small into the large intestine through the ileo-cæcal valve. This variety has been named *ileo-colic*.

3. *Ileo-cæcal* invagination. In this the cæcum is inverted, and passes into the colon, carrying with it the ileum, which forms the innermost of the three layers. The relation of the ileum to the cæcum is unaltered, and the ileo-cæcal valve forms the presenting part, or lowest point of the intussusception.

4. *Colic* invagination. Here colon passes into colon, the

<sup>1</sup> "Vierteljahrsschrift für die praktische Heilkunde, 1873," Bd. cxviii., 120, 121.

ascending into the transverse, the transverse into the descending, the latter into the sigmoid flexure, or the sigmoid flexure into the rectum.

Invagination of the small intestine may occur at any point, but is found, in the great majority of cases, in the lower part of the ileum. Less frequent, on the whole, than ileo-cæcal invagination, it is exceedingly rare in infants, while in adults it occurs rather more often than the ileo-cæcal variety. Ileo-colic intussusceptions are exceedingly rare, and constitute, according to Leichtenstern, only eight per cent. of the entire number. The invaginated ileum is seldom of great length, and this form of intussusception sometimes coexists with the ileo-cæcal. The latter variety predominates in frequency over all the rest, and in children under a year old is twelve times as frequent as intussusception of the small intestine, and between two and three times as frequent as all the other forms combined. The relative frequency of ileo-cæcal invagination continues up to the tenth year of age. Lastly, colic intussusception stands next below that of the small intestine in regard to frequency, and is most often seen in childhood.

One of the most forcible objections that have been urged against abdominal section is the difficulty of ascertaining the precise cause of obstruction. Now, it will be found, I think, that the symptoms of intussusception, when carefully studied, are often so definite as clearly to indicate the nature of the morbid process, whereas in most other forms of intestinal obstruction, an exact diagnosis is often impossible, and consequently an operation is generally performed only as a last resort, and when delay has almost annihilated the chances of success. The symptoms that denote intussusception are vomiting, pain in the abdomen, constipation, tenesmus, and the discharge from the bowel of bloody mucus. Added to these is the presence of a tumor, felt through the abdominal walls, and often, when the disease involves the large intestines, likewise in the rectum. In rare instances the invaginated gut protrudes through the anus, and, if the intussusception be ileo-cæcal, the valve guarding the orifice of the ileum may perhaps be distinctly recognized. In establishing a diagnosis,

the relative value of the symptoms will be found to be very different. Vomiting, abdominal pain, and constipation, are met with in most, if not all forms of acute intestinal obstruction; and although in conjunction with other symptoms, they afford important corroborative evidence of intussusception, they cannot, either singly or collectively, be regarded as pathognomonic. Tenesmus, when accompanied with the evacuation of bloody mucus, may indicate dysentery, but when the signs of obstruction coexist, intussusception must be suspected. In acute cases the discharges may be distinguished from those of dysentery by the entire absence of fecal matter. They are met with both in children and adults, but are more common in the former. Tenesmus is generally associated with the cæcal or colic intussusception, and often depends upon the presence in the rectum of the invaginated intestine. But unquestionably the most unmistakable signs of intussusception are those which depend upon the existence of a tumor formed by the intussuscepted mass. The detection of such a tumor will be more or less difficult according to the length and situation of the intussusception, the age and obesity of the patient, and the amount of tympanitic distention of the abdomen. In the early stages of the affection tympanitis is rare, especially in children, the intestinal canal being well emptied by both vomiting and purging. Later, the existence of peritonitis may be attended with so much distention as to render an examination by palpation of little value. A short intussusception, especially of the small intestine, may escape detection, while a long one, which is usually also thicker, may be readily recognized. Other things being equal, an invagination of the large, will form a more prominent tumor than one of the small intestine. In infants, the method of conjoined manipulation already described greatly facilitates the examination of the abdominal contents, and will occasionally reveal the presence of a tumor that would otherwise escape detection. In ileo-cæcal intussusception—the most common variety—the tumor may be felt either in the region of the cæcum, or along the course of one or more segments of the colon, depending on the extent of the invagination. The tumor, however, has rarely been discovered in the region of

the cæcum, partly because in the beginning it is of small size, and may be wanting in firmness, and also because—the progress of the disease in such cases being usually rapid—the intussuscepted intestine speedily leaves the iliac fossa, and travels along the colon. In infants, this extension of the disease is rendered easy by the great mobility of the cæcum and the length of the meso-cæcum and meso-colon, which latter has by some writers been erroneously described as abnormal, and by many regarded as constituting a predisposition to intussusception. The detection of the intussuscepted colon will be difficult if it occupies the situation of either of the colic flexures, particularly the right one, where it will be overlaid by the liver. Most often it is found along the course of the descending colon, where it forms an elongated swelling somewhat movable from side to side, and frequently becoming harder and more prominent during a paroxysm of pain. This latter characteristic may serve to distinguish such a tumor from one caused by fecal accumulation, and deserves attention, as mistakes have sometimes been committed in regard to these two affections.

Another weighty objection in many cases to abdominal section for intussusception is the fact that the disease may terminate in spontaneous recovery. This may happen either with or without sloughing and expulsion of the intussuscepted part. A case of spontaneous reduction has been recorded by Wilks,<sup>1</sup> in which the symptoms had lasted for eight weeks. Other similar instances might be cited of chronic invagination, in which the constriction was not supposed to be tight. But, although cases of recovery by spontaneous reduction in acute intussusception have been reported,<sup>2</sup> their number, even if accepted as authentic, is too small to affect the general result, or to justify an expectant mode of treatment.

In regard to recovery after sloughing of the intussuscepted intestine, it may at first be remarked that in infants such an event is almost unknown, and in older children is far less frequent than in adults. This appears to be due to two causes. Ileo-cæcal intussusceptions, which predominate in

<sup>1</sup> London *Lancet*, 1870, vol. i., p. 731.

<sup>2</sup> Leichtenstern, *op. cit.*, Bd. xii., p. 40.

children, are much more rarely cast off than those of the ileum, which are found mainly in adults. Moreover, young subjects, in consequence of their feeble powers of resistance, generally succumb to the disease at an early period, before the time has arrived for the separation of the slough. Neither can it be denied that the shedding of the invaginated part is rare even in adults, or that subsequent recovery occurs only in a small majority of those in whom the separation is completed. And even when the patient survives, entire restoration of health seldom happens, the patient being liable to manifold derangements of the digestive functions, or to other serious general or local disorders dependent upon the organic changes which have taken place in the alimentary canal. Thus colic, diarrhœa, constipation, and stricture of the bowel, have been frequently observed; while marasmus, dropsy, abscess, and septicæmia, are among the graver evils that have been known to follow, more or less remotely, the shedding of the intussuscepted part. Nevertheless, as recovery by this process is more frequent than by any other, it must not be undervalued, but the chances of such an occurrence fairly estimated in any given case.

By many writers the terms acute and chronic have been employed to distinguish two varieties, if not stages, of intussusception. In the chronic form there exists simple invagination of the gut, the parts being free from inflammation, and the functions of the alimentary canal more or less regularly performed. This condition is closely analogous to that of reducible hernia, and may continue for many weeks or months without causing very serious mischief. But it is liable, at any moment, to pass into the acute form, which, however, often arises independently of the other. This resembles strangulated hernia, and is characterized by swelling, infiltration, extravasation, and inflammation of the intussuscepted part, tending to mortification, and due chiefly to pressure on the mesenteric vessels. In well-marked acute cases the course of the disease is rapid and severe, terminating, if left to Nature, either in the death of the patient or in the shedding of the intussuscepted part. This may be cast off as early as the third day, but the separation usually occurs between the tenth

and the twenty-first day of the disease. In chronic cases, as was pointed out by Mr. Hutchinson, there is rarely any considerable alteration in the structure of the affected parts; and, adhesions being generally absent, the invaginated intestine can be drawn out without much force. In acute cases, on the other hand, the tissues soon become damaged, the morbid changes taking place more or less quickly according to the degree of strangulation present. At first, the invaginated parts become congested and œdematous, and during this stage hæmorrhage into the bowel is a frequent symptom. Later, softening, adhesions, sloughing, and ulceration mark the progress of the disease. General peritonitis, however, is a rare event, unless the intestine is perforated, and fecal matters escape into the serous sac.

Before endeavoring to estimate the value of abdominal section in cases of intussusception, it is of course desirable to inquire whether milder and safer means do not afford a reasonable chance of success. A great number of remedies have been vaunted in the treatment of this affection. Opium, belladonna, calomel, drastic cathartics, and metallic mercury, have been administered internally, while leeches, fomentations, and ice-bags have been applied to the abdomen. Some of these so-called remedies must be positively injurious, while none of them should, in my judgment, be employed in a case at all urgent. It is possible that when the symptoms are mild, and the danger of strangulation remote, the administration of opium or belladonna might be beneficial by diminishing the spasmodic action of the muscular coat of the bowel, and by thus favoring the reduction of the invagination by mechanical means; but in an acute case I should lay down the maxim which ought, as I think, to govern us in the management of strangulated hernia, namely, to lose no valuable time before effecting reduction by mechanical means. These means include—abdominal section excepted—kneading the abdomen, the introduction of a sound through the rectum, and the distention of the large intestine with either air or water. Kneading the abdomen may perhaps be occasionally valuable as an auxiliary measure, but is too uncertain to be depended on alone. The introduction of a sound or a probang

into the rectum has been known to afford relief in a few instances of colic intussusception. But it is a dangerous expedient, which is only applicable when the invagination is confined to the lower division of the intestine, and even in such a case it might be preferably replaced by either insufflation or injection. These last-named methods are undoubtedly the best in vogue, and deserve a trial in every case in which the invagination is believed to be reducible, and to be situated in the large intestine. I cannot spare time to describe them, but may be allowed to make a few remarks concerning their employment. As already intimated, they are of value only when the intussusception involves the large intestine, as there is no reason to believe that either water or air can, in the living subject, be made to enter the small intestine from the colon. It is desirable, when injecting either air or water, to avoid undue violence, lest the intestine give way under the pressure to which it is subjected. Such an event would of course prove fatal, and cases in which either complete or partial rupture has occurred during inflation or injection, are recorded by Marsh, in the fifty-ninth volume of the "Medico-Chirurgical Transactions." In suitable cases these methods are attended with the happiest results, the invaginated intestine yielding to the compressing force, the abdominal tumor disappearing, and the normal functions of the alimentary canal being promptly restored. How much force should be employed must be left to the judgment of the surgeon; and the same rules ought to guide him as those which apply to the use of the taxis in cases of strangulated hernia. If injection or insufflation causes severe pain, it should be considered as dangerous. In the case I have narrated, the disinvagination of the greater part of the intussuscepted intestine was accomplished by inflation and injection without much difficulty; but I desisted from further attempts of the kind because the child suffered severe pain, and because I felt that greater force than I employed might be hazardous. And the state of the intussuscepted parts, as revealed when the abdomen was laid open, proved that my fears had been well grounded. The intestinal coats were so œdematous and infiltrated, and the invaginated gut was so firmly fixed in its abnormal position, as

to render its reduction quite difficult, even when I had the advantage of direct manipulation. I have no doubt whatever that, if I had persevered in the attempt to effect disinvagination by forcible injection, I should have caused a rupture of the intestine, with its fatal consequences.

Enough has now been said to enable us to discuss the question whether the operation of abdominal section ought ever to be undertaken; and, if so, in what cases it might be performed with the greatest chances of success. We may assume that the following facts are well established. Intussusception is a disease which, if left to its natural course, terminates fatally in a large majority of cases. In infants the mortality is especially high, being, so far as statistics inform us, not less than 'eighty-six per cent.' of the entire number, whether subjected to treatment or not. In a small minority of cases the patients recover after sloughing of the intussuscepted part, although recovery is rarely permanent and complete. Medicine has little or no effect upon the disease. Replacement by the introduction of a sound, by inflation, or by injection, can be effected in a certain number of cases in which the obstruction is seated in the large intestine, but in a considerable number it will be found impracticable. Bearing these facts in mind, the question of employing the knife as a last resort naturally demands attention; but, until recently, the opening of the abdomen for the relief of intussusception has been generally condemned as a doubtful and desperate expedient.

Even at the present day, notwithstanding the success which has attended the operation in British practice, it is emphatically denounced by many authorities both at home and abroad. In a discussion on the treatment of intussusception which lately took place at a meeting of the Suffolk District Medical Society, in Boston, Dr. J. B. S. Jackson, the eminent Professor of Pathological Anatomy in the Harvard Medical School, remarked that "he considered opening the abdominal cavity for intussusception with a view to withdrawing the invaginated intestine a foolhardy procedure, since it would usually tear before it could be withdrawn, even in compara-

<sup>1</sup> Leichtenstern, *op. cit.*, Bd. cxxi., p. 17.

tively recent cases.”<sup>1</sup> Mr. T. Holmes, in his “Treatise on Surgery,” published in 1875, while admitting the expediency of operation in certain chronic cases, says that “in the acute, I have no doubt that the patient has a better chance from the natural cure.”<sup>2</sup> Mr. Thomas Bryant, writing in 1876, makes the following statement in regard to early operation: “In the very early stage it might do good before the invaginated bowel has become adherent, and Gay tells us that this does not take place for four or five days after the first symptoms, and may not for ten. But in the early period the diagnosis is too uncertain to allow of such a proceeding, and the chances of a natural cure have not passed away.”<sup>3</sup>

Such statements as these, which might easily be multiplied, show that the operation has not yet obtained the general approval of the profession; and although the success recorded by Mr. Hutchinson and others has proved the value of surgical interference in chronic cases, its value in the acute form of intussusception remains to be established. As tending toward the settlement of this latter point, therefore, the case I have related may not be unimportant. And in considering the applicability of abdominal section to the various forms of intussusception, I am disposed to maintain that, unless future experience shall prove that the danger of the operation itself is unwarrantable, it would seem to be indicated, provided other expedients had failed:

1. In cases of chronic intussusception, in which there is reason to believe that the condition is one of simple invagination, unaccompanied by adhesion or other structural changes that would prevent reduction. In such cases, as Mr. Hutchinson has justly observed, the tendency to spontaneous cure by gangrene is very slight, while in the absence of inflammation the operation may be undertaken with the least possible risk. Should it be neglected, the patient will probably die either from pain and exhaustion, or in consequence of the super-vention of the acute or inflammatory stage.

2. In acute cases, whether primary or secondary, if seen

<sup>1</sup> *Boston Medical and Surgical Journal*, January 18, 1877.

<sup>2</sup> “A Treatise on Surgery,” London, 1875.

<sup>3</sup> “The Practice of Surgery,” London, 1876, vol. i., p. 596.

soon after the commencement of the attack. At what precise period the surgeon ought to refuse to perform an operation it is at present impossible to determine, but there can be no doubt that, the earlier the operation is done, the greater will be the chances of success. On the other hand, when the strangulation is tight, the parts speedily become so altered by swelling, adhesion, and softening, that no amount of force short of that capable of causing rupture will suffice to liberate them. A case is recorded by Messrs. Fagge and Howse<sup>1</sup> in which death had occurred within two days from the commencement of the disease, and in which, at the autopsy, it was found impossible to replace the whole of the invaginated bowel; and, in the accompanying table, a number of cases will be found, in which, at operations performed from three to five days from the beginning of the disease, reduction was ascertained to be either difficult or impossible. My own case is the only one that I know of wherein, in an intussusception primarily acute, an operation has been performed at a period earlier than three days from the first appearance of symptoms. In this, just eighteen hours had elapsed, and I should infer, from the behavior of the invagination when it was under examination, that the delay of a few hours more might have rendered reduction impossible.

3. There remain a considerable number of cases that cannot be included in either of the preceding categories, but in which an operation might possibly be indicated. Besides the well-marked acute and chronic forms of the disease, others are sometimes met with, varying considerably in severity, according to the degree of strangulation present, and in which the irregular succession and alternation of symptoms makes the interpretation of the latter more or less difficult and uncertain. The surgeon fears that whatever course of treatment he may adopt will prove a failure; but although in such cases active interference must always be hazardous, it will be plainly his duty to estimate, as accurately as he can, the pathological condition of the imprisoned intestine, and to resort to abdominal section, even at a comparatively late period, provided the patient's strength is not too much reduced, and

<sup>1</sup> "Medico-Chirurgical Transactions," vol. lix., p. 94.

there appears to be no probability of a spontaneous separation of the affected part. But further data must be procured before a definite rule can be framed respecting this class of cases; and I think it extremely doubtful whether enough success will ever be obtained to warrant the frequent employment of the knife.

As intimated in an earlier part of this paper, abdominal section for intussusception has been rarely performed. In 1874 an elaborate and interesting statistical paper on the subject was published by Dr. Ashhurst,<sup>1</sup> who gave the details of fourteen cases, all that he had been able to collect up to the date of his publication. The table appended to this communication contains the record of twenty-one cases, thirteen of which can be found recorded by Dr. Ashhurst, while of the eight additional ones seven have occurred within the past three years in British practice, and the remaining one is the case herewith reported. I have omitted from the table Dr. Ashhurst's first case, as the nature of it appears to me doubtful. It will be noticed that, of the twenty-one operations recorded, one only was performed in the last, while the remaining twenty have been performed in the present, century.

Of twenty cases in which the result of the operation is given, seven recovered and thirteen proved fatal, thus showing a mortality of sixty-five per cent. So far, the figures appear to justify the operation, as the mortality is less than that of all cases taken together, which, according to Leichtenstern,<sup>2</sup> is seventy-three per cent. But this rough comparison of figures, if not a misapplication of statistics, is really of little value; and a much more discriminating analysis must be instituted before we can make any useful application of the facts to individual cases.

Out of twenty cases, the mortality of the operation in the different forms of intussusception is shown as follows:

	No. of Cases.	Recovered.	Died.
Intussusception involving the small intestine.....	1	1	..
Intussusception involving the large intestine.....	14	4	10
Seat of intussusception not mentioned.....	5	2	3

<sup>1</sup> *American Journal of Medical Science*, 1874, vol. i., p. 48.

<sup>2</sup> *Op. cit.*, Bd. cxxi., S. 17.

The rarity of operations for the relief of intussusception of the small intestine is doubtless due to the relative infrequency of the disease, the tendency to recover by sloughing, and the difficulty of making an exact diagnosis. Whether in adults the introduction of the hand into the rectum—according to the method recommended by Simon—will enable us to detect, and possibly to relieve, an intussusception of the small intestine, is a point which certainly deserves attention.

The *apparent* influence of age upon the success of the operation is exhibited by the following statement :

	No. of Cases.	Recovered.	Died.
Two years old or under.....	12	3	9
Sixteen years old or over.....	7	4	3

The operation in infants is thus placed in a very unfavorable light, the mortality being no less than seventy-five per cent., while in adults it is only forty-three per cent. But there is a fallacy lurking here, which can be exposed by a comparison of the cases with reference to the state of the intussuscepted parts at the time of the operation. And, as an indication of their condition, we may classify them into : first, those in which reduction or disinvagination was found to be easy; and, second, those in which reduction was found to be either difficult or impossible. Arranged in this manner, the nineteen cases available for comparison exhibit the following result :

	No. of Cases.	Died.	Mortality.
Reduction easy.....	7	1	14 per cent.
Reduction difficult or impossible.....	12	11	91 per cent.

Pursuing the same method of investigation, and separating the cases of infants from those of adults, we obtain results which may be stated thus :

	Adults.		Infants.
Reduction easy.	{ Cases 3. } Died 0. { Mortality, 0. }		{ Cases 4. } Died 1. { Mortality, 25 per cent. }
	Adults.		Infants.
Reduction difficult or impossible.	{ Cases 4. } Died 3. { Mortality, 75 per cent. }		{ Cases 8. } Died 8. { Mortality, 100 per cent. }

From the above statements I think we may safely conclude that the mortality of abdominal section is probably determined much more by the condition of the intestine than by the age of the patient. For we find—taking all cases together—the mortality of the operation to be fourteen per cent. in the easy, and ninety-one per cent. in the difficult cases; while in infants we obtain a mortality in easy cases of twenty-five per cent., and in difficult ones of one hundred per cent. This would encourage us to hope that in infancy the operation may not prove to be contraindicated, and that even if the success attending its performance falls somewhat below that obtained among adults, it may yet be quite enough to justify the surgeon in having recourse to it under certain circumstances. Furthermore, we must remember that in infancy the chances of spontaneous recovery are almost nothing, and that, consequently, when the usual methods of replacement have been fairly tried and proved unavailing, the child must either be abandoned to its fate, or submit to the risks of an operation. Nevertheless, I am far from advocating its performance in every case in which other means have failed, and believe that much discrimination will be necessary to prevent the operation from being brought into disrepute.

Whenever the patient is not seen until late in the disease, the question will of course arise whether reduction should be attempted by *any* mechanical means, or whether, on the whole, it will not be safer to abstain from all active interference, and trust to the chances of spontaneous cure by sloughing. When firm adhesions have formed, or gangrene is in progress, an attempt to effect reduction by distending the intestine would be likely to precipitate a fatal result by causing rupture. As to the plan of operating at all hazards, and cutting away, if necessary, the intussuscepted parts, I think it must be looked

upon as a desperate expedient, which has obtained no sanction from past experience.

As I have already remarked, the practice of abdominal section for intussusception is comparatively novel, and many more facts must be obtained before we can go far beyond the region of conjecture. But the success which the operation has already achieved warrants the hope that its general adoption, in carefully-selected cases, will save many lives that would otherwise be lost, and mark an important step in the progress of abdominal surgery. In conclusion, I may be allowed to state briefly the more prominent facts and opinions contained in this paper, and upon which I would invite discussion :

1. The success which has already been obtained in the operation of abdominal section for intussusception is sufficient to justify its repetition, when other means have proved unavailing.

2. There is reason to believe that in intussusception, as in strangulated hernia, the great danger lies in delay, and that, in acute cases, the operation, to be successful, must be performed at a very early period, probably within twenty-four hours from the invasion of the disease.

3. In chronic cases, the operation is indicated when other means have failed, and there is reason to think that the invagination is still reducible.

4. It has been proved, by the case herewith related, that the operation may succeed in acute cases, if performed during the first eighteen hours.

5. The greater fatality of the operation in infants has been shown to be rather apparent than real, and it remains to be proved whether, in them, the performance of abdominal section for intussusception may not yield gratifying results.

6. In infancy the operation is the more justifiable, because during that period there is hardly any tendency toward spontaneous recovery after sloughing of the intestine.

No.	Reference to Operator.	Age and Sex.	Conditions, Symptoms, and Treatment before Operation.	Duration of Disease before Operation.	Result.	Remarks.
1	Velse, in Haller's Disputat. Anatom., 1751.	50 yrs., F.	Considerably reduced; had been treated unsuccessfully by enemata, cups, and fomentations.	Not stat'd.	Recovered.	Oblique incision on left side, four fingers' breadth from umbilicus; reduction easy; no adhesions.
2	Ohle; Rust's Magazine, Berlin, 1817.	50 yrs., M.	Intestine protruded beyond anus, and was cut into under the impression that it might be hæmorrhoidal. Bougies and enemata used without effect. Pain, vomiting, and tenesmus, well marked.	11 days.	Died about 12 hours after operation.	Oblique incision, five and a half inches long. Much force required in reducing colon, which was adherent for nearly twelve inches. <i>Post-mortem</i> showed general peritonitis with gangrene of the invaginated gut.
3	Fuchsius; Hufeland's Journal, 1825.	28 yrs., M.	Movable swelling near umbilicus, pain, vomiting, and constipation. Treatment, venesection, anodynes, cathartics, and administration of six-ounce doses of metallic mercury.	10 days.	Recovered.	Incision eight inches in length along outer border of right rectus muscle. Unable to reach upper end of intussusception, the operator opened the bowel at lower end, and pushed back the invaginated part, which measured over two feet in length.
4	Gerson, 1838, Am. JI. Med. Sc., 1874.	12 w'ks., M.	Intestinal obstruction and hæmorrhage; tumor felt in inguinal region, and on examination <i>per rectum</i> .	Not stat'd.	Died in a few hours.	Oblique incision in left inguinal region parallel with Poupart's ligament; adhesions firm, and invagination extensive and irreducible. At a gangrenous point intestine was ruptured, causing operation to be abandoned.
5	Wilson, Am. Journ. Med. Sc., 1836.	20 yrs., M.	Stercoraceous vomiting and intestinal obstruction. Purgatives and metallic mercury were administered without effect.	17 days.	Recovered.	Incision five inches in length through linea alba. Invagination found in ileum, which was livid, and so firmly adherent, that considerable force was required to reduce it.
6	Hauf, Heidelberg Med. Annal. 1843.	36 yrs., M.	Pain, vomiting, intestinal obstruction, protrusion from anus of gangrenous bowel, and abdominal tumor. At time of operation, patient was prostrated with acute peritonitis.	4 or 5 days.	Died 9 days after operation.	Oblique incision on left side, above Poupart's ligament; adhesions firm; intestine ruptured, and operation abandoned. General peritonitis existed at time of operation.
7	Pirogoff, St. Petersburg, 1852.	16 yrs., M.	Symptoms of obstruction.	Considerable duration.	Died soon after operation.	The invaginated bowel being found gangrenous, the intestine was opened, and an artificial anus established.

No.	Reference to Operator.	Age and Sex.	Condition, Symptoms, and Treatment before Operation.	Duration of Disease before Operation.	Result.	Remarks.
8	Wells, Trans. Path. Soc., London, 1863.	4 mos.	Invaginated bowel felt in rectum. Injections, inflation, and sponge-probang failed to afford relief. Child nearly moribund when operation was begun.	4 days.	Died 5 hours after operation.	Incision in median line below umbilicus. Intestine released with difficulty, and punctured to relieve distention.
9	Laroyenne, Server; de l'Occlusion Intestinale, 1870.	Not mentioned.	Not mentioned.	Not mentioned.	Died.	Disinvagination could not be effected, owing to adhesions.
10	A. Johnstone, Brit. Med. J., Dec. 6, 1873, and Lancet, Feb 11, 1873, p. 738.	Infant.	Symptoms were those of acute obstruction.	Not mentioned.	Died in a short time from inflammation.	No difficulty was encountered in withdrawing the bowel.
11	Weinlicher, Schmidt's Jahrbücher, 1872.	6 mos., F.	Acute obstruction; vomiting, pain, discharge of bloody mucus, and tumor in left hypogastrium. Exploration of the rectum afforded no information.	3 days.	Died 6 hours after operation.	Incision three inches long at outer border of left rectus muscle; much difficulty in effecting disinvagination. Autopsy showed acute peritonitis.
12	Hutchinson, Med. Chir. Trans., vol. lvii., 1874.	2 yrs., F.	Vomiting, pain, occasional discharge of bloody mucus, and prolapse of the bowel through the anus. Abdominal tumor felt on left side. Symptoms not acute, and "no real obstruction of the bowels." Enemata tried without effect.	1 m'th.	Recovered.	Incision in median line below umbilicus. Reduction easy; no adhesions.
13	Duncan, Edin. Med. J., June, 1874.	5 mos.	Diarrhea, griping, and discharge of bloody mucus. Abdominal tumor; intestine felt <i>per rectum</i> . Inflation and injection unsuccessful.	Not stated.	Died 24 hours after operation.	Median incision. Invagination extensive, and released by a combined process of taxis and traction; patient rallied well, and death occurred suddenly, apparently from syncope.
14	Marsh, Med. Chir. Trans., 1876.	7 mos., M.	Acute symptoms set in twelve hours before operation. Cæcum protruded from anus. Insufflation and injections tried without effect.	14 days.	Recovered.	Median incision below umbilicus. Invagination (ileo-cæcal) reduced without much difficulty, although its exposure required the removal from the abdominal cavity of a large proportion of the small intestine.
15	Howse, Med. Chir. Transact., 1876.	33 yrs., F.	Gradually increasing symptoms of obstruction. Pain, vomiting, and abdominal tumor, varying in position. Inflation practised three times without success.	18 days.	Recovered.	Incision four inches in length opposite umbilicus. Tumor withdrawn from abdomen, and more than eighteen inches of intestine reduced. Invagination ileo-cæcal. No adhesions.

No.	Reference to Operator.	Age and Sex.	Condition, Symptoms, and Treatment before Operation.	Duration of Disease before Operation.	Result.	Remarks.
16	Hutchinson, Med. Chirg. Trans., 1876.	6 mos.	Symptoms acute from the beginning; pain, vomiting, evacuation of bloody mucus, and tenesmus; invaginated bowel felt in rectum and through abdominal wall. Injections had failed. Patient extremely weak at time of operation.	4 days.	Died 8 hours after operation.	Long incision in median line; invagination reduced with difficulty; no adhesion; some escape of feces from a puncture of the small intestine, made to relieve distention. <i>Post-mortem</i> revealed almost universal peritonitis.
17	Bell, London Lancet, Jan. 1, 1876.	16 mos., M.	Vomiting, constipation, tenesmus, and passage of bloody mucus; tumor felt <i>per rectum</i> and through abdominal wall. Abdominal tympanites. Injections and inflation unsuccessful.	5 days.	Died 7 hours after operation.	Median excision extending from one inch above umbilicus nearly to symphysis pubis. Intestines congested; transverse and descending colon invaginated and irreducible. Artificial anus established by opening bowel above intussusception. <i>Post-mortem</i> showed slight adhesions, much induration of the invaginated parts, and recent lymph between intestinal folds.
18	British Med. J., Sept. 16, 1876.	9 mos.	Retching, and bloody stools. Ileo-caecal valve recognized on surface of intestine protruding from anus.	7 days.	Died a few hours after operation.	Disinvagination effected by squeezing intestine. Patient died in collapse. <i>Post-mortem</i> showed peritoneal adhesions, and hemorrhage in mesentery. It was thought that earlier treatment might have been successful.
19	Morris, London Lancet, Jan. 20, 1877.	12 yrs., M.	Pain, vomiting, constipation, and passage of blood from the bowel. Tumor felt in rectum. Injections tried without success.	7 days.	Not known; case reported on day of operation.	Abdominal section revealed an intussusception of ileum, with sloughing of intestine; seventeen inches of ileum removed, and divided ends stitched to margins of opening in abdominal wall.
20	Howse, Med. Chirg. Trans., vol. lix., 1876.	5 mos.	Muc o-sanguinolent discharges. Ileo-caecal valve had protruded from anus for some days. Case had been mistaken for prolapse of the rectum.	1 m'th.	Died a few hours after operation.	Intestine, which was softened, ruptured under gentle traction. Four inches cut away, and healthy intestine above and below united by sutures.
21	Sands, case herewith reported.	6 mos., F.	Pain, vomiting, tenesmus, and passage of bloody mucus. Tumor felt in rectum and through abdominal wall. Inflation and injection only partially successful.	18 hours.	Recovered.	Median incision below umbilicus. Caecum invaginated, indurated, and ecchymotic. Reduction effected by squeezing intestine rather than by traction.

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