INVAGINATION OF LIMITED ANNULAR GANGRENE OF THE SMALL BOWEL VERSUS RESECTION.*

JOHN E. SUMMERS, JR., M.D.

OMAHA.

It is the accepted practice and teaching of surgeons the world over, in cases of gangrenous intestine, to proceed to one of two lines of action: (a) The formation of an artificial anus, and (b) resection. "Whenever possible, i. e., in cases in which the condition of the patient, and the experience and help ready to the surgeon's hand admit of his taking this step, the gangrenous intestine should always be resected" (Jacobson and Rowlands). When the opposite conditions prevail, an artificial anus should be formed with the hope that this will prove a life-saving measure and that at a later operation the continuity of the intestinal canal can be re-established. The increasing experience of late years is tending more and more toward the selection of resection of the gangrenous intestine as against the formation of an artificial anus. This teaching emanates from good authority; it should, however, be accepted with some caution, as it is based on an ability in the selection of cases by men who are also especially skilled in intestinal surgery.

Most of the failures that have fallen to my lot in the management of patients with gangrene of the intestine have followed attempts to carry out the ideal; too much has been done, and this has been my observation of the work of others. It takes good common sense to weigh the pros and cons regarding resection in a given case of gangrene of the intestine. The patient's condition must be fairly good to warrant resection.

The amount of gangrenous intestine a patient can carry and still be in a condition of resistance to admit of a successful resection has never been accurately determined. This amount may vary from one centimeter ($\frac{3}{8}$ in.) to two meters ($6\frac{1}{2}$ ft.) and possibly more, but it is not always the extent of the gangrene that determines the resistance of the patient. A limited gangrene of short duration, accompanied by marked constitutional symptoms, is of graver import than one of an opposite type, i. e., one more extensive in the length of bowel involved, and longer duration of strangulation, but with rather mild constitutional symptoms. A resection in the former case must be made relatively twice as extensive as in the latter, because the mesentery has been invaded by infective products beyond the parts that appear healthy, even if the blood vessels do bleed freely on division.

The object of this paper is to call attention to a simple and safe manner of handling limited annular gangrene of the small intestine without resection, by invagination of the gangrenous bowel. Especially can I commend the procedure in those dangerous cases in which the success of a resection may be in grave doubt and the formation of an artificial anus the only alternative. The technic is applicable to the treatment of traumatism to the small intestine from contusions and gunshot wounds, the repair of which, because of their peculiarly destructive, bursting character, if accomplished by suture, may so limit the lumen as to result in dangerous stricture or kinking of the bowel.

CASE 1.—History.—In September, 1900, a young man was brought to the Clarkson Hospital, Omaha, suffering with a

right inguinal hernia which had been strangulated for four days.

Operation.—He was in a condition of such marked collapse that I doubted the propriety of any surgical attempt. However the field of operation was prepared, cocaine injected (a general anesthetic was out of the question) and the hernial sac opened. It contained a loop of small intestine, a piece of which 4 cm. ($1\frac{1}{2}$ in.) long, was gangrenous, and although soft, was not very friable. The lumen of the bowel above and below the gangrenous ring was about the same, due unquestionably to the two days of stercoraceous vomiting which had preceded the patient's entrance into the hospital. As the man's general condition did not warrant a resection it occurred to me to make an intussusception of the gangrenous intestine, invaginating by manipulation sufficiently far so as to have sound tissues to suture at the neck of the intussusception, using for the purpose a circular continuous, sero-muscular stitch of silk. No attempt was made towards a radical cure of the hernia.

Postoperative History.—The usual restorative measures were employed and the patient's condition gradually improved. His bowels moved at the end of twenty-four hours and he made a good recovery. Six months after the operation I received a letter from him saying that he was in excellent health, but that he still had his hernia.

CASE 2.—History.—In the autumn of 1907 an elderly man was sent to me by Dr. Hill of Lyons, Neb., suffering with a strangulated, right oblique inguinal hernia. When the man arrived at the Omaha General Hospital the strangulation had been in existence some fifteen hours, but he was in excellent condition.

Operation.—An immediate operation under ether, was done. The bowel was found to be in the same condition as in Case 1, with the exception that the gangrenous ring was not quite so extensive. An intussusception was formed after passing four equidistant sero-muscular, Halstead mattress silk stitches around the circumference of the bowel—i. e., parallel to its long axis. In making these stitches the needle was entered first 1.5 cm. ($\frac{1}{2}$ in.) below the gangrenous ring and then at about the same distance above it, and then back again near the point of starting. As the ends of these stitches were pulled on by an assistant, the invagination was aided by grasping the bowel below the stitches, between the index and middle fingers, and pulling upward, while, with the thumb above, pressure was made downward—a method similar to that employed in reducing a paraphymosis. Great gentleness, was, of course, exercised in making this manipulation. After tying the Halstead stitches the line was reinforced by a circular sero-muscular silk stitch. A Ferguson operation for the radical cure of the hernia was then done. The man recovered without complications and has remained well since.

CASE 3.—History.—In December, 1907, a boy, aged 16, was accidentally shot in the abdomen with a 0.32 caliber pistol and was operated on by me nine hours later in the Omaha General Hospital.

Operation.—There were twelve perforations of the small bowel, all very easy of repair except one which was so destructive (explosive) in character that to suture it would practically have closed the lumen of the bowel. Neither was it possible to trim the edges of the wound so as to form a rhomboid that could be sutured advantageously. It was a resection and nothing less, unless the injured bowel could be treated as in Cases 1 and 2. The latter was done, about 3.5 cm. ($1\frac{1}{4}$ in.) being invaginated. No complications ensued and the boy made a good recovery.

In a similar case it would be more surgical to destroy, by crushing with an angiotribe forceps, the ragged flaps of the wound before making the intussusception, thus assuring a smooth surface within the bowel at the line of suture. If the extent of gangrene involves more than 5 cm. (2 in.) of the intestine, it would certainly be necessary, before making the invagination, to deal with the mesentery by freeing it from the bowel and resecting it or not as the condition indicated.

* Read in the Section on Surgery and Anatomy of the American Medical Association, at the Fifty-ninth Annual Session, held at Chicago, June, 1908.

There are possibilities of usefulness of the technic described in this paper by extending its employment to the treatment of annular strictures of the intestines, small and large. These strictures can be removed *per vias naturales* after devitalizing the bowel above and below with an angiotribe forceps and invaginating the devitalized diseased structures into the bowel to be passed off as an intussusceptum. There are also other possibilities along the same line, for example, in relation to resections.

There may be mechanical contraindications to the technic offered; (a) when a loop of gangrenous intestine longer than 10 to 12 cm. (4 or 4½ in.) would appear rather difficult to manipulate, or (b) when the bowel is thick and edematous immediately above the gangrene, or very much contracted below it, the difficulties of invagination may be insurmountable. However, the distended bowel above can be reduced by employing Monk's method of using a glass tube to relieve the distention.

I am sure that a dead piece of intestine may be invaginated upward, and if a properly reinforced through-and-through continuous silk suture is employed, making the neck of the intussusception broad and strong, there will be no giving way, but the current in the intestinal tube will pass naturally with the sloughing off of the intussusceptum. Senn's experimental work in this form of invagination carries no contradiction to the above statement.

I make no pretense to being the first surgeon to invaginate a gangrenous loop of bowel when otherwise a resection or the establishment of an artificial anus must have been done. It was original in so far as I, personally, was concerned, and I had been led to believe from the best obtainable sources that the procedure was new. Alas, there is little new under the sun. Professional medical bibliographers and others had failed to find references to the technic, but I discovered in my own library, after this paper was written, that Guinard reported, at the French Congress of Surgery in 1895, a case of gangrene of the small intestine in which he successfully invaginated 9 cm. (3½ in.)—and many practical surgeons may have done similar work.

My own experience with this technic is so limited that I do not feel warranted in saying very much for it, but I am convinced, nevertheless, that I could have applied it with advantage to my patients in many resections for gangrene and other lesions of the intestine which I have done since my first application of the principle in 1900.

DISCUSSION.

DR. ARCHIBALD MACLAREN, St. Paul, Minn.: It seems to me that Dr. Summers' suggestion is excellent and that it opens a field of great usefulness, especially the suggestion of the use of the angiotribe. Dr. Lund says that in Boston they have pursued this course in a number of instances, but never published the work.

DR. L. L. MCARTHUR, Chicago: Dr. Summers' paper describes an extension of a method which both Dr. Bevan and myself have been utilizing in cases of gangrene of the bowel when small in extent and involving only a section of about one-third of the circumference of the bowel, as may be found in the gangrene which accompanies Littré's hernia, simply invaginating that segment of the bowel. Dr. Summers has shown that it is possible to go further and introduce into the bowel a gangrenous mass 4 to 8 c.c. in length, but smaller than an intussusception, and get good results by the sloughing off of the mass. I believe that he has added to our armamentarium very decidedly.

RECENT STUDIES ON THE CIRCULATION AND THEIR IMPORTANCE TO THE PRACTICE OF MEDICINE.*

ARTHUR D. HIRSCHFELDER, M.D.

Associate in Medicine, Johns Hopkins Medical School.
BALTIMORE.

The contributions to our study of the circulation during the past few years have been so numerous that I shall be able to deal only with a few of those aspects in which I have been most directly interested and which I feel are of practical importance; namely, the relation of arrhythmias and of the velocity coefficient to treatment and the studies on the volume and tonicity of the ventricles.

One of the most interesting and important results of physiologic study has been the physiologic analysis of the irregular pulses, which has led us to divide them into four groups:†

THE FOUR GROUPS OF IRREGULAR PULSES.

First, those which, either associated with certain phases of respiration or with meningitis, or in children, neurasthenics or convalescents from febrile diseases, are of neurogenic origin. (Fig. 1.) These are not associated with any cardiac disturbance, disappear temporarily under atropin, sometimes permanently disappear under general "tonic" treatment, hygienic measures and the administration of strychnin.

The second group, due to diminished contractility, is shown in the *pulsus alternans* in which, though the rate is regular, each alternate beat is small. This is most common in very rapid pulses, and as Mackenzie has shown, also in some cases of angina pectoris. It always shows that the heart is beating too fast and that its strength is insufficient, and hence if the condition continues more than a few hours it may be considered as a symptomatic indication for digitalis or strophanthin intravenously.

Thirdly, we have to deal with the three varieties of heart block (Fig. 2) at the various sites along that inverted Y-shaped path of Purkinje fibers—the sino-auricular blocks, the auriculo-ventricular blocks, and the blocks between the ventricles. Of the latter we know but little, and Doctor Hewlett² has told what we do know. The sino-auricular block (Fig. 2, 1) as we know it, especially in the cases described by Dr. Hewlett and myself, is always functional, and since it is often brought on by digitalis it need not be added that in this digitalis is absolutely contraindicated. The same applies in the auriculo-ventricular blocks (Fig. 2, 2 and 3), whether organic as in Adams-Stokes disease, or due to myocardial weakness and vagal stimulation as in the post-influenzal or post-diphtheric conditions or due to

* Read in the Section on Practice of Medicine of the American Medical Association, at the Fifty-ninth Annual Session, held at Chicago, June, 1908.

1. For a more complete discussion of the cardiac arrhythmias consult:

Wenckebach, K. F.: *Die Arrhythmie als Ausdruck bestimmter Functionstörungen des Herzens*, Leipzig, 1903.

Mackenzie, James: *The Study of the Pulse and Movements of the Heart*, London, 1903; *New Methods of Studying Affections of the Heart*, Brit. Med. Jour., 1905, i, 519, 587, 702, 759, 812.

Hirschfelder, A. D.: *Graphic Methods in the Study of Cardiac Diseases*, Am. Jour. Med. Sc., 1906, cxxxii, 378.

Dock, G.: *Recent Advances in the Study of Heart Disease*, Wisconsin Med. Jour., August, 1907.

Hewlett, A. W.: *The Common Cardiac Arrhythmias and their Clinical Significance*, Internat. Clin., 1907, series 17, iv, 47.

2. Hewlett, A. W.: *Clinical Observations on Absolutely Irregular Hearts*, paper presented at this session of the Section on Practice of Medicine.