

with or without resection of gut, it is well to pass a long rubber ligature through a neighboring part of healthy mesentery, allowing both ends to lie in the wound firmly tied together. By traction on this ligature the involved gut may be withdrawn for inspection. When the danger has passed the ligature may be easily withdrawn. (Lilienthal.)

Helferich recommends lateral anastomosis between the proximal and distal portion of the intestine above and below the gangrenous area. This opening should be about 4 cm. (1.6 inches) long, and allows the fecal contents to pass into the healthy gut below without touching the suspicious loop of intestine. This places the damaged gut under very favorable conditions, especially as it is not distended. The anastomosis is replaced within the abdominal cavity, while the suspicious portion of the gut is left outside. If the intestine recovers, it may be replaced; but even if it becomes gangrenous, the conditions are comparatively favorable, because a large part of the fecal contents passes through the anastomosis and the fecal fistula formed closes within a short time. Although this method seems very plausible, still the author prefers to resect the intestine, because the amount of interference is practically the same. If there is any reason for not resecting, Riedel's method of drawing the loop of intestine out of the hernial ring and opening the same for the purpose of emptying, may be made use of. Within a short time a sharp line of demarcation forms. These patients recover from the shock of strangulation provided there has been no peritonitis, and in the course of twenty-four to forty-eight hours the intestine may be resected under much more favorable conditions because it is easier to distinguish the limits of the healthy intestine. Besides this, the immediate danger is much less. Most of the fatal cases after primary resection occurred in the first twenty-four hours after operation. The method of uniting the intestine over small gangrenous areas, or over suspicious areas, especially in the region that has been constricted, is dangerous and not to be recommended. Fatal perforation took place in 3 of 5 cases in the Heidelberg clinic, and there is also danger of stenosis on account of the extensive invagination. Should it after all be considered advisable in a given case to turn such doubtful or gangrenous patches into the gut by suture, subsequent stricture may be avoided by suturing so that the line of suture will be circumferential, not longitudinal. (Lilienthal.) It is much better to resect, and in many cases a wedge-shaped piece may be taken out of the gut without operating upon the mesentery. As far as an artificial anus is concerned, it would be most convenient simply to amputate the gangrenous portion of the intestine. This, however, is frequently not sufficient to give the perfectly free passage that is necessary if the operation is to be in any way successful. Should division of the hernial ring also prove insufficient, then the intestine must be drawn down and tacked to the sac with a few stitches. In spite of these measures the intestine at times does not empty itself, the gangrene progresses, and fatal peritonitis results.

Statistics.—Bruns and Hofmeister report 64 herniotomies with a total mortality of 22 per cent., 25 of the cases having gangrenous intestine:

	Cases.	Died.	Per cent.
Artificial anus	5	4	80
Exposure of suspicious loop	4	3	75
Primary resection	17	4	23

Petersen, in Czerny's clinic, reports 74 herniotomies with 17 cases of gangrene:

	Cases.	Died.	Per cent.
Artificial anus	5	5	100
Primary resection	12	1	8

The following table is taken from Hofmeister's work:

	Artificial anus.	Died.	Primary resection.	Died.
Maydl	12	5	9	2
Krönlein	15	13	12	8
Braun	7	6	8	3
Körte	23	16	3	1
Helferich	8	7	12	6
Hahn	—	—	18	5
Bramann	66	30	2	1
Czerny	11	8	5	3
Meleschko	13	8	1	—
Eiselsberg	1	1	8	5
Wilms	3	2	6	2
Obalinski	—	—	74	41
Socin	3	1	20	12
Springorum	—	—	19	6
Hofmeister	5	4	17	4
Petersen	5	5	12	1
	172	106	226	100
		(61.6 per cent.)	(44.2 per cent.)	

If Bramann's cases are not taken in consideration, the death-rate from artificial anus will be 71.7 per cent.

After replacing the gut a radical operation may be performed if there are no counterindications. Eiselsberg operated 48 times, and was obliged to omit the radical operation only 4 times. If there is suppuration in the hernial sac, or if a large quantity of clear serum or cloudy or foul-smelling exudate flows from the peritoneal cavity after opening the hernial ring, or if an extensive resection is performed on intestine the vitality of which is doubtful, and finally if the sac or the neck of the sac has become infected with pus or feces during the operation, then a radical operation should be omitted. In all of these cases it is better to leave the hernial ring open and pack with iodoform gauze, or put in a rubber or glass drain surrounded with gauze. It may be possible to close the hernial ring in a few days by a secondary operation, provided no harmful after-effects appear, or the wound may be allowed to heal by second intention under continued packing. If there is some doubt but still hope that the case will progress favorably, then provisional sutures may be placed that can be tied within a few days.

It is best in these cases to knot each individual suture separately. If the hernial ring has been cared for, then the external wound may be closed so as to have healing by first intention. It is not uncommon to have some disturbance after operations of this sort, especially in the superficial layers, and for this reason it is frequently advisable to close only the lower layers, and to keep the skin-wound open for several days with a thin iodoform gauze drain. This may be eventually removed and the wound closed by secondary suture or allowed to heal by second intention. The dressing should consist of some absorbent material held down by strips of adhesive plaster. Formerly opium was always given after an operation for strangulated hernia, so as to rest the injured intestine and with the idea of preventing peritonitis. At the present time opium is given only when there is some distinct indication. After an early operation which has been uncomplicated there is no more reason for giving opium than after any laparotomy. In the cases in which there has been gangrene of the gut, in which there has been a resection performed the result of which is doubtful, or when there is reason to suspect that the abdominal cavity has become infected, it may be well to give twenty drops of the tincture of opium four times a day, so as to limit peristalsis and allow adhesions to form which tend to wall off the pus. It is best not to give food until the bowels have moved and the general condition of the patient has improved sufficiently to show some return of appetite.

If the operation is performed before there are any severe changes in the bowel, it is common to have recovery undisturbed. Within a few hours after relieving the obstruction the patient has a movement of the bowels or a large quantity of gas is passed. The nausea and vomiting cease, the temperature may become subnormal, and the dry tongue becomes moist again. If the strangulation has lasted for some time and there is considerable decomposed fecal matter in the intestine with some disturbance of nutrition, the pulse may remain small and rapid, and the temperature frequently rises within a few days to 38.5° C. (101° F.). The tongue remains coated and the patients suffer from nausea, vomiting, and headache. Not infrequently there is profuse diarrhoea; large quantities of foul-smelling, dirty brown fluid feces are passed with considerable pain. The symptoms are due to poisoning secondary to absorption from the intestinal tract. These patients should be stimulated by injections of camphor or moderate doses of alcohol, repeated subcutaneous infusions of normal salt solution, poultices, etc. Sometimes bismuth and opium are of value. If there is no movement of the bowels for several days, and at the same time there are no symptoms of strangulation, there is no cause for worry as a rule, and it is justifiable to wait for three or four days. If, however, there is a sense of discomfort in the abdomen—slight distention—it may be possible to remove the symptom by high injections of oil or by using castor oil by mouth. There are cases in which the bowels do not move in spite of these measures. The general condition improves after relieving the constriction, and to all appearances there is no

danger. After three or four days, however, the abdomen commences to swell. Vomiting reappears, which may even be fecal in character, although there are no symptoms indicating peritonitis or internal strangulation. Treatment is useless and the patients die of inanition within a few days. On autopsy there is no sign of peritonitis or of obstruction, but the loop of intestine which was strangulated is found completely collapsed and the gut above enormously distended with fecal matter. The condition is really one of paralytic obstruction. The constriction was not sufficient to produce gangrene, but was sufficient to cause permanent disturbance of circulation with subsequent paralysis of the muscles.

Secondary internal intestinal obstruction after herniotomy is not uncommon. The replaced intestine may become caught over a strand of omentum, or the gut may become adherent to the abdominal wall or twisted in its longitudinal axis. Besides this there are the cases of apparent reduction described in connection with taxis. The symptoms of internal incarceration may follow the signs of strangulated hernia immediately, and the only way to relieve the condition is by immediate abdominal section. The conditions are much more difficult when the signs of obstruction are relieved after herniotomy and the bowels have moved before signs of obstruction appear again. If there are inflammatory changes in the intestine, one will not hesitate to interfere radically because of the great probability that adhesions will be found. The questions that arise in this connection are extremely difficult to decide, for peritonitis may produce a very similar clinical picture.

Infection may have taken place at the time of operation, although this is uncommon with modern technic, as shown by statistics. The most common cause is that a loop of intestine, supposedly healthy, has suffered sufficiently to become gangrenous after being replaced, and that very fulminating septic peritonitis develops as soon as the gut ruptures. Sometimes an abscess forms around the gangrenous area and general infection of the peritoneal cavity takes place more slowly. This sort of peritonitis develops as a rule after one or two days. There are, however, cases in which severe peritonitis develops immediately after the operation, and the temperature rises to 39° C. (102° F.) on the first day, followed by a fatal termination within a short time. In all probability, infected hernial fluid enters the peritoneal cavity in these cases, for it is uncommon to find any gangrene of the intestine on autopsy. The differential diagnosis between intestinal obstruction and peritonitis is considered elsewhere; but if there is reason to suppose that there is a diffuse peritonitis, the abdomen should be opened immediately.

If there is localized suppuration, the condition is treated on general principles. After resection of the intestine it is not uncommon to have localized suppuration. The pus finds its way to the hernial ring, chiefly because the loop of intestine lies in this region and is apt to be bound to the abdominal wall by adhesions. In these cases the wound should be freely opened and the abscess drained so as to prevent infec-

tion of the general peritoneal cavity, and not infrequently the case terminates favorably after removal of the pus even when it contains fecal matter. A fecal fistula may remain for some time, but as a rule closes of its own accord. After inguinal hernia gangrene of the testicle is sometimes observed. When the cord is spread out over the hernial sac, the spermatic artery is at times injured in spite of all precautions. This accident is followed by gangrene of the testicle. The wound may heal by first intention, but after a few days the scrotum swells, becomes red, and fluctuates. If the wound is open, thin pus escapes mixed with shreds of tissue. Little by little other shreds of tissue come away and the thickening of the scrotum persists. Finally larger pieces appear, and if traction is made on these the testicle may come away *in toto*. Alarming symptoms of intestinal obstruction sometimes appear after the operation. These may appear when a suspicious piece of intestine has been inverted or when large ulcers of the intestine heal within the lumen of the gut when there has been no perforation. Garrè reports an interesting case in which extensive cicatricial stenosis followed gangrene of the mucous membrane of a strangulated loop.

Artificial Anus.—Sometimes these cases terminate quite favorably if the overlying tissues rupture at about the same time that the intestinal wall gives way, so that the fecal matter is allowed to escape. As a rule this does not take place, and large cavities form filled with decomposing matter and fresh abscesses and pockets appear again and again. One should make large and free incisions, so as to drain these pus cavities, and be careful that there is no obstruction to the passage of feces from the ruptured gut.

When making an artificial anus, one should render the conditions of the wound as simple as possible, and, although the operation takes but little time, many of these patients die within the first days because they become exhausted, or peritonitis develops in spite of the artificial opening or perhaps existed beforehand. The wound cannot be treated antiseptically, of course, but should be packed with iodoform gauze without obstructing the passage of intestinal contents. Some absorbing material should be placed over the opening and changed frequently. The surrounding skin should be covered with vaselin. In spite of these precautions it is not uncommon to have extensive eczema, pustules, and ulcers, because the entire region is constantly bathed in fecal matter. The wound itself cleans up very slowly, and it is of advantage to place patients of this sort in a permanent bath, or at least have them in a bath for several hours, which favors cleaning up of the wound.

Attempts have been made to nourish these patients by injections, not only by rectum, but also through the artificial opening. These experiments have not been very satisfactory, for the material runs out unaltered, either because of some mechanical obstruction or because of the antiperistaltic movements. The danger of death from inanition is great, and one is not infrequently obliged to close the opening early

after separating the ends of the intestine and uniting them as rapidly as possible. The author speaks of a fecal fistula when only a portion of the fecal contents escapes through the opening. With an artificial anus all of the fecal matter escapes through the new opening and the intestine below remains empty. Fecal fistulas are more apt to be found in connection with strangulated hernias of the wall of the intestine, whereas an artificial anus is produced whenever an entire loop of intestine becomes gangrenous. The adjacent surfaces of the proximal and distal ends of the gut adhere to each other, and after the loop has been thrown off both openings appear side by side, separated by one partition, consisting of the portion of the gut where the mesentery is attached. This partition, which is called the "spur," is somewhat more prominent, and prevents fecal matter from the proximal end entering the distal portion of the gut. This latter portion rapidly diminishes in size because of disuse, and it may be extremely difficult to find the lumen. The mucous membrane of the proximal end is frequently prolapsed, and may become adherent to the skin, while the surrounding region heals with extensive scar formation.

The skin around a fecal fistula is frequently much irritated, and it is not uncommon to have many sinuses beneath the surface opening in various places. These sinuses are the remains of suppuration that took place before the abscess ruptured. They may heal or fresh fecal matter may lodge in them and produce suppuration. Small fecal fistulas may heal independently, but large ones and an artificial anus never heal spontaneously. The spur must first be removed, and recovery takes place only when the obstruction to the passage of feces into the lower end of the bowel is completely removed.