strictly circular opening is in favour of umbilical hernia.

A rare condition—*hernia of the umbilical cord*—requires only casual mention. Large herniæ are unmistakable. They may contain part of the liver, which is readily recognised by palpation. They increase in size during expiration, and grow tense during crying. Small herniæ of the cord may be overlooked. It is necessary, therefore, to examine the cord of the newly born for small reducible tumours.

Herniæ which appear at rare sites (such as ventral, obturator, sciatic) must be recognised by the general diagnostic signs common to all herniæ.

Diaphragmatic hernia rarely causes symptoms unless it becomes incarcerated. If symptoms of internal obstruction appear, this condition should be borne in mind. After injuries which might cause rupture of the diaphragm, herniæ certainly should be thought of; but, as a matter of fact, they are usually first recognised at autopsy. A large hernia may cause symptoms pointing toward the nature of the trouble, such as dyspnœa; unilateral compression of the lung, with stomach tympany on the same side of the thorax; displacement of the heart; change in position of liver dulness (for the stomach usually helps to form part of the contents of a diaphragmatic hernia). Manual examination of the abdomen by the rectal method of G. Simon might be employed both to clear the diagnosis and to aid in reduction of the hernia.

CHAPTER XXIII

STRANGULATED HERNIÆ, AND CONDITIONS SIMULATING INCARCERATION

I HAVE often heard surgeons praised for their boldness, their successes, and their courage in accepting risks. I would like to confront such a surgeon with a patient presenting the symptoms of obstruction, who at the same time possessed one or more irreducible herniæ. Would the surgeon have the courage to say, "None of these herniæ are strangulated; I shall not do a herniotomy"? It requires no courage to operate such a case at the present day; but to refrain from doing a life-saving operation calls for courage of conviction, which is justified only by most careful observation and accurate analysis. The case just presented is, therefore, one in which the thoroughness and experience of an operator is put to the test. Even if these qualities are present in the highest degree, cases arise in which it is impossible to decide whether the symptoms of obstruction are due to the irreducible hernia or to other causes. Translated into a rule for practice, the sentence will read: *In doubtful cases, operate.* The greatest herniotomists have erred, and cut down on non-strangulated herniæ; the most experienced surgeons have failed to discover strangulated herniæ, or have failed to recognise them.

In the present discussion, let it be emphasized, the signs used for diagnosis apply only to typical cases. In doubtful cases, *in dubiis—nulla libertas*, but herniotomy. The diagnosis of incarceration is assured by the symptom-complex of the disease.

First of all, I call attention to the following fact: No experimenter or histologist has demonstrated that strangulation is accompanied by "inflammation" of the affected coil of intestine. Only isolated clinicians spoke of inflammation in strangulated hernia. If the pedicle of a tumour is tied off, or if a finger is surrounded tightly by a string, the parts distal to the ligature do not become inflamed; *stasis* and *gangrene* result. If the unprejudiced observer studies the strangulated loop, with the above-mentioned points kept in mind, he will not discover symptoms of inflammation. The loop will appear red, chestnut-brown, hemorrhagic in spots, gray at the point of strangulation or kinking, or, at a later stage, collapsed, pulpy, gangrenous. The intra-abdominal portion of the gut contiguous to the gangrenous spot may become inflamed; when the loop becomes gangrenous, the sac and all the coverings of the hernia also rapidly inflame, so that abscess formation takes place. The strangulated parts, however, show only stasis or gangrene. Consequently, division of strangulation into periods of hyperæmia, inflammation, and gangrene is unjustifiable.

Two main questions remain for us to decide: 1. Is the hernia strangulated? 2. Has gangrene begun?

The signs of STRANGULATION may be divided into local, abdominal, and general.

Local Symptoms of Strangulation.—The hernia is no longer reducible, although the patient previously was always able to reduce it; reduction now becomes impossible, even to the physician. At the same time, a marked *increase in tension* is noticeable in the hernial tumour, if its contents be gut. We shall limit the present remarks to such cases. This tension increases more or less rapidly from hour to hour, under our eyes. The

tumour is sensitive, especially at its neck and more particularly in the vicinity of the hernial orifice (in the inguinal and femoral varieties); deep pressure causes considerable pain. The orifice is no longer patent to the finger, and in some cases a sharply defined constriction of the hernial mass may be recognised at the opening. If intra-abdominal pressure is suddenly increased, no impulse can be felt, for the hernial orifice is entirely shut off. The percussion note is flat.

The flat note obtained over strangulated herniæ may be explained in the following ways: With rare exceptions, strangulation is due to elastic constriction—i. e., the loop is forced through the hernial orifice by the *vis a tergo*. Its contents is milked out, and remains behind. The empty loop is placed outside the orifice, later its lumen is filled with blood and mucus; hence the flat note.

The *abdominal symptoms* which may be looked for are the following: The abdomen gradually distends, owing to the slow development of *meteorism*. Soon after the stasis of intestinal contents has begun the gut contracts intermittently, in a vain attempt to force the fæces past the point of strangulation. New impulses continually stimulate the intestines, which contract with great vigour. Single loops become erect, visible through the anterior wall; in other words, the portion of the *gut situated above the obstruction shows peristalsis*. This overaction, however, does not occur unaccompanied by pain; on the contrary, *severe, spontaneous pain, colicky in nature*, is felt in the hernia, and, more especially, radiates about the navel. At first the belly is merely sensitive to the touch; later, pressure causes pain. Some time after the strangulation has taken place the patient begins to *vomit*, not violently, as a rule. At first the vomitus consists of stomach contents; it then be-

comes greenish and bitter from the admixed bile; and toward the end, feculent intestinal contents, or, in some instances, a true fæcal vomiting, appears. Constipation is absolute. As this symptom requires considerable time to develop, another earlier sign must be relied upon. This is the *inability to pass gas*, in spite of repeated and violent efforts.

The *general symptoms* are not of particularly striking nature. At first the patient suffers from malaise; he then grows anxious, and his pulse becomes rapid. Frequent vomiting tires and weakens him still further; his extremities grow cold; the pulse small, rapid, and intermittent. The facies is found altered, the nose is now sharp, the eyes sunken, the skin cadaverous in colour, and covered with cold sweat. Unless exceptionally strong, the sufferer dies of exhaustion and intestinal auto-intoxication. Only few live to be relieved by gangrene of the affected loop, with external rupture and spontaneous cure by the formation of an artificial anus. The development of this outcome can be diagnosed only by the local signs. Marked œdema and inflammatory redness of the skin covering the tumour, swelling of all the layers composing the hernia, which grows broader and flatter, point to it. The peculiar crepitation obtained over the swelling shows that the deep-lying structures have become gangrenous, and that suppuration is taking place. *Gangrene of the strangulated hernia is, therefore, recognised by the occurrence of a phlegmon of the hernial coverings, accompanied by the usual signs of suppuration.*

The various symptoms of strangulation preserve a certain sequence and quantitative relation to one another. At the outset, when the tension in the hernia

is not yet very great, meteorism is moderate, and vomiting occurs spontaneously, at intervals of one or two hours only, unless the patient drinks (as his ever-increasing thirst constantly tempts him to do). Drinking is promptly followed by vomiting. The general condition is but slightly disturbed. If the obstruction is unrelieved, the tumour increases in size; the colicky pains become more violent, the belly more distended and painful, spontaneous vomiting increases in frequency, the pulse rate is accelerated. This sequence and relation of the symptoms may be termed *harmony* of the signs of strangulation.

The rapidity with which this symptom-complex develops depends upon manifold reasons, many of which are but partly understood. Cases have been observed in which strangulation caused death within a few hours. In these, vomiting was incessant, pain very marked, and exhaustion rapid. In other cases the course is slow; the strangulation persists for many days, even longer than one week, and all the symptoms develop with corresponding slowness. In most instances we may take for granted that the danger of gangrene is very imminent toward the end of the second or beginning of the third day. The course may be classified as *peracute*, *acute*, and *subacute*. Certain local findings at the site of the hernia are of more value than the amount of pain or the frequency of vomiting. If the hernia is very tense, the neck thin, the hernial canal narrow (inguinal, or, in the female, femoral), the constriction tight, gangrene will occur more rapidly. Local conditions, less constricting in nature, will produce a more subacute course, and not demand as early surgical interference. Rarely, cases are observed in which, in

spite of persistent strangulation, vomiting does not appear. The other symptoms, such as tension in the hernia, irreducibility, local pain, and absolute constipation, are, however, present. Be guided by the local symptoms in these cases, and operate. I was greatly surprised, when operating upon an incarceration of five days' duration (unaccompanied by vomiting), to find typical strangulation.

Exceptionally one or more symptoms may vary or be absent in cases of true strangulation. Although constipation and vomiting stand at the head of the list, among the symptoms of strangulation, the bowels may, in exceptional instances, move during the attack.

In the first place, the movement may take place by emptying of the segment of bowel situated below the point of obstruction. This usually follows the administration of an enema. In the next place, the strangulation may be of such a nature that the lumen of the bowel is not totally obstructed. If the vermiform appendix or a congenital diverticulum of the small intestine forms the hernial contents (Littré's hernia), it seems possible that the fæces should not be completely obstructed. But, even in these conditions, constipation has been observed. In an oft-quoted case of Dieffenbach's, choleraic diarrhœas were noted. Goyrand quotes a similar case. Dieffenbach, who performed more than six hundred herniotomies, mentions two cases in which, although vomiting was wanting among the symptoms of strangulation, stupor appeared. Both cases were in old men. In the one, operation showed a congested and strangulated loop. After the constriction was relieved the patient awoke from his stupor. Cases in which the abdominal pain is insignificant are not uncommon. Strong, healthy peasants do not complain of pain; they may walk long distances in order to seek medical advice for a "spoilt stomach." One case came to my knowledge where an exceptionally robust fellow undertook an hour's journey to seek his physician. He had been vomiting for a whole day, the strangulation was severe, and yet he had shown no signs of weakness. Attempts at taxis were made with the patient in the erect posture. Only after these had been continued for some time did the patient drop down in a faint, and then reduction promptly followed.

If merely a portion of the intestinal wall is strangulated the lumen may yet be completely occluded, for the two segments of the loop usually lie parallel, and therefore the severest incarceration may result. A hernia of the appendix, or of Meckel's diverticulum, may have advanced to gangrene without producing complete obstruction.

All of the preceding goes to show that in an atypical course of strangulation the local symptoms—*irreducibility*, *tension*, and *pain at the hernial orifice*—are of the utmost importance. The tension, especially, is significant. Danzel, who has had great experience, calls the tension "characteristic." It is indeed so, but the peculiar sensation imparted to the finger can not be described in words; the hernia must be palpated. This must include the answer to the question of how to determine *the* incarcerated hernia, if symptoms of strangulation occur in an individual who has several irreducible herniæ.

We now come to the question of how to act if symptoms *simulating strangulation* set in, especially absolute constipation, vomiting, and abdominal pain. Patients are brought to a medical clinic with supposed peritonitis, and a strangulated hernia is discovered. Or, just

as frequently, patients who are suffering, not with strangulated hernia but with peritonitis, are brought to the surgeon for taxis or herniotomy. The first thing to do in all cases is to examine the usual hernial sites, and to determine whether or not there is a hernia; and, if so, whether or not it is strangulated. A cursory examination will not suffice, for not only should the more common sites, such as inguinal, femoral, and umbilical regions, be examined, but the possible occurrence of sciatic and obturator hernia must be kept in mind. If these regions are found negative, the whole abdomen must be examined, in order to exclude a ventral hernia which might occupy any situation. It is evident that a small hernia may readily escape notice if the opening is deeply situated and the patient fat. But, as even a *small* strangulated hernia is tense, has a smooth surface, and is painful at the hernial orifice, it ought not to be overlooked. In the Allgemeine Krankenhaus, in Vienna, a patient was admitted for strangulated ischiadic hernia, because a tympanitic note was found over a certain spot in the gluteal region. I mention this case in order to bring out the point that a tympanitic note is always obtained over the sciatic foramen unless the individual is specially fat. Therefore this sign can not be relied upon. If, however, the hernia is larger, the tumour can not be overlooked.

If no tumour is discovered, *internal strangulation* is by no means excluded.

Let us assume that we are dealing with such a case, and attempt to rule out other conditions simulating internal strangulation. The first condition requiring exclusion is PERITONITIS. The chief points of difference may be thus tabulated:

1. In obstruction, the patient moves, gets out of bed, and walks about. In olden days such patients were forced to dance. In peritonitis, the sufferer lies in bed and avoids all motion.

2. Spontaneous pain, especially colic, is characteristic of obstruction; pressure causes pain only at the site of strangulation. In peritonitis, the slightest pressure causes pain; the whole abdomen is sensitive.

3. Obstruction is accompanied by violent peristalsis; the loops of gut squirm and grow erect; peristaltic waves move toward the point of stenosis. Peritonitis early causes intestinal paresis.

4. Obstruction runs an afebrile, peritonitis a febrile, course.

We see cases of intestinal obstruction in which a general peritonitis develops at an early stage. In these cases the more important peritoneal symptoms rapidly assume prominence—especially the general tenderness to even slight pressure and the fever. Here the constipation and vomiting are often ascribed to peritonitis. Even in such cases the diagnosis should be directed into the correct channels by the vomiting, which resists all treatment, constantly grows more severe, and finally becomes fæcal. It might be added, that the most important symptom of peritonitis is the demonstration of an inflammatory exudate collected in the free peritoneal cavity. But just in these cases it is rarely possible to obtain dulness, for the exudate lies hidden among the distended loops of obstructed intestine. The inflammation must be recognised by the pain on pressure and the fever. On the other hand, the uncontrollable vomiting, especially fæcal vomiting, conjoined with