

toneum. It consists essentially of two layers. The outer layer is composed of fibrous and elastic tissue. It supports the inner layer, which is composed of flat endothelial cells. Between the margins of the cells are numerous openings of lymphatic vessels, stomata, which are the active absorbents of the peritoneum. Some regions, as those of the diaphragm and small intestines, are especially rich in lymphatic vessels, while in others, as the omentum, the number is small. For this reason a peritonitis is more dangerous in certain localities.

When the antero-lateral abdominal wall is opened, the peritoneal cavity is also opened. In the living body, however, no cavity exists, parietal and visceral layers being held in contact by muscular action and atmospheric pressure. The great omentum is seen hanging from the greater curvature of the stomach, covering more or less completely the viscera in the lower half of the cavity. Normally it should do so quite completely, but it may be found collected in a roll about some organ or loop of intestine. This is especially the case when there has been a former peritonitis. The omentum serves to protect the intestines, and also as a storehouse for fat, but its most important function is that of limiting an infection. It readily contracts adhesions about organs, such as an inflamed appendix or a perforated intestinal coil, and so prevents infection of the general peritoneal cavity. In extensive pelvic suppuration, the omentum may completely exclude the pelvic from the general abdominal cavity. Behind the omentum are the small intestines, and, on either side of the posterior wall, the ascending and descending colons.

The mesentery of the transverse colon is raised with the great omentum. As it is attached transversely across the posterior abdominal wall, it divides the cavity into two compartments. The upper contains the liver, stomach, and spleen. It also includes the lesser peritoneal cavity. The lower compartment contains the small intestines and the colon. It is subdivided by the mesentery into an upper right and a lower left portion. The upper portion ends below in the right iliac fossa. Consequently a fluid effused in this region or on the upper surface of the mesentery will gravitate into the right iliac region. The left and lower portion passes to the pelvis, into which cavity fluid will descend when it originates below and to the left of the mesentery.

The relations of the lesser peritoneal cavity are described with those of the stomach. *Thomas A. Olney.*

ABDOMEN. (SURGICAL.)—The abdominal viscera, unlike those of the cranium and thorax, are contained within a cavity whose walls are composed chiefly of soft tissues and to a relatively slight extent of bony and cartilaginous structures. The viscera of the upper abdomen are protected in some degree by the lower ribs and their cartilages, and those of the lower abdomen by the pelvic bones, while posteriorly there is the lumbar spine.

The muscular wall of the abdomen, too, varies in thickness, and hence in its protecting properties, in different regions, being heavy and solid in the loins, and relatively thin at the sides and front.

These defences are more apparent than real, for while viscera may be shielded by them from the effects of violence acting in certain directions, practically all the abdominal contents are exposed to violence acting from in front.

The dangers of abdominal injuries depend also in no small measure upon the character of some of the viscera themselves.

The gastro-intestinal canal, although its mobility within the abdomen unquestionably enables it in many instances to escape the effects of violence, yet contains matter in a high degree infectious, which, finding its way into the peritoneum, regularly excites a dangerous and usually fatal peritonitis.

Distention of the hollow viscera also favors injury of them, for not only is there thus a larger mark for violence to act upon, but the increased tension of their walls facilitates the rupturing effect of violence. Others of

the viscera, as the liver, spleen, kidney, and great vessels, are practically fixed and immovable, and therefore are subject to injury from a degree of violence sometimes comparatively slight.

The abdominal walls are lined by, and the viscera wholly or partially covered by, the peritoneum. This membrane, by rendering the movements of the abdominal organs upon one another and beneath the abdominal walls easy, no doubt often facilitates their escape from the results of violence which would otherwise inevitably produce injury of them, and thus it becomes a conservative agent.

On the other hand, peritonitis, however produced, is the most dangerous and oftenest fatal of the consequences of abdominal injuries.

Peritonitis developing as the consequence of injuries assumes one or other of three types. First, it results in the formation of adhesions between contiguous peritoneal surfaces, without pockets containing fluid of any kind; or, second, the adhesions form pockets shutting in collections of pus of greater or less size.

In both of these types the peritonitis is confined to some particular region of the abdomen and involves only a part of the peritoneum, the rest of it remaining uninfamed. Such types are distinctly conservative.

In contrast to them there is a third type in which the peritonitis, instead of being circumscribed, spreads quickly and soon involves the whole peritoneum. Such a type of peritonitis is usually fatal, while the first two are by no means necessarily so.

Peritonitis is invariably the result of infection by pus-producing bacteria either from without, through lesions of the abdominal walls, or from within, through lesions of the viscera, particularly of the gastro-intestinal canal.

Why, in different instances, different forms of peritonitis are produced, does not as yet seem evident. We have not the means for determining what is the rôle of the peritoneal cells and other defensive factors in combating infection. Several facts are apparent, however. Numerous experiments and observations have shown that the development of peritonitis is greatly promoted by the presence of blood in the peritoneal cavity; it is known also that infection by the contents of the intestine high up is milder than when escape of the contents of the colon occurs; and, finally, it is known that small fecal extravasations may be encapsulated, while large ones are usually followed by a general peritonitis.

Bile in moderate quantities may cause only an adhesive peritonitis; less frequently a general peritonitis follows. The same is true of perfectly normal urine; but decomposing urine, or urine containing inflammatory products or contaminated by unclean instruments—all of which are conditions implying the presence of bacteria—quickly excites a septic peritonitis.

It is convenient to classify injuries of the abdomen into two groups: (1) The subcutaneous, including contusions; (2) the open or wounds.

Subcutaneous injuries may be confined to the abdominal wall, or there may be lesions of the viscera also.

The open injuries may be confined to the abdominal wall without penetrating it, or they may simply penetrate the abdomen without injuring any of the viscera, or there may be a prolapse or a wound of the viscera.

SUBCUTANEOUS INJURIES of the abdominal wall result from the infliction of direct violence by blows, kicks, falls against obstructions, spent balls, passage across the abdomen of wheels, crushing by machinery, etc. In this group, too, are included those cases of overexertion in which muscles are ruptured. This accident is apt to occur in the recti, the diaphragm, or the erector spinae, particularly in the presence of degenerative changes in these muscles.

Blood is extravasated between the retracted ends of the muscle torn by overaction or crushed by direct force; and after its absorption, repair occurs by cicatricial tissue, which may occasionally yield to intra-abdominal pressure and become the site of hernia. Ecchymosis also occurs

over wide areas beneath the skin or in the subserous connective tissue.

The wounds of the abdominal wall which do not penetrate are not in themselves peculiar injuries. With proper treatment they heal readily; but care must be exercised in the accurate approximation of the cut muscles to prevent the subsequent development of hernia.

Another condition and one totally different presents itself the moment the peritoneum is penetrated; then the wound becomes a grave injury, with the possibility of peritoneal infection and septic peritonitis; but the dangers of such wounds depend upon their size, upon the implement by which they are inflicted, and upon the presence or absence of foreign bodies.

Small wounds inflicted by narrow, sharp blades are relatively innocuous and are usually recovered from; the visceral peritoneum, especially the omentum, becomes adherent to the abdominal wall in the region of the wound, the general cavity is shut off, and healing occurs without incident. In the case of larger wounds in which there is more or less gaping, or in those inflicted by dirty implements or complicated by the presence of foreign bodies, so great a surface of peritoneum is infected that no adequate adhesion occurs and a septic peritonitis follows. This may be prevented, however, in a certain proportion of cases at any rate, by proper wound treatment.

Through wounds of the abdominal wall, even if of small or moderate size, and almost certainly through those of any considerable dimensions, prolapse of one or other viscus, or of parts of viscera, is apt to occur. The omentum is most apt to escape; next the small intestine; and, when separated from their attachments, parts of the liver and the whole or portions of the spleen and kidney have been known to undergo a prolapse.

The viscus, especially if prolapsed through a small wound, soon becomes congested and oedematous, and adherent at the margins of the wound; it may then remain fixed there, or become wholly or partly necrotic.

Occasionally, as in the case of the omentum, the wound is plugged and permanently sealed; or a peritonitis spreads from the wound and destroys the patient's life.

The dangers which prolapse of viscera thus adds to those inherent in the penetrating wound of the abdomen, are the increased risk of peritonitis, unavoidable from the necessity of returning a prolapsed area of peritoneum almost certainly infected, and the likelihood of injury or of strangulation of the prolapsed viscera.

INJURIES OF SPECIAL VISCERA.

1. The Liver and Its Ducts.—While the liver is protected within certain limits by its position beneath the ribs and their cartilages, its relative fixity renders traumatic lesions fairly frequent.

Subcutaneous injuries are oftenest the result of crushing violence or of blows inflicted directly over the liver, and are not infrequently associated with fractures of the ribs, under which circumstances the bony fragments may be the agents by which the liver lesion is produced.

The lesion varies from slight subperitoneal laceration to fissures of some depth and extent, or even pulpification of the affected region or separation of masses of liver tissue. The lesion occurs oftener in the right lobe than elsewhere.

Open injuries of the liver are usually the result of bullet or stab wounds, and the lesion itself varies from a small puncture to a large incision or hole.

In all these lesions, except those which are subperitoneal, bleeding is free and often profuse, and constitutes the main danger to life. Healing of the injured liver tissue occurs readily; but it may be interfered with by infection conveyed by the blood current or introduced from without.

The prognosis is modified in great measure by the presence or absence of associated injuries of other viscera. The mortality is reckoned by Edler* at 85.7 per cent. for

* Edler: Langenbeck's Arch., vol. xxxiv.
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contusions, 55 per cent. for gunshot wounds, 64.8 per cent. for stab wounds—average, 66.8 per cent.; for uncomplicated injuries, 54.6 per cent.

With or without injury of the liver itself the gall bladder or the ducts may be injured, and this may be followed by the escape of bile into the peritoneum in quantities more or less great.

Peritonitis regularly follows, but there are on record a considerable number of cases which are exceptions. In them, in subcutaneous injuries, the extravasated bile has been encapsulated, and the patient has been saved by repeated aspirations; or the bile has escaped externally through fistulae formed in the tract of wounds, the flow gradually diminishing as these closed.

Treatment of injuries of the liver is directed chiefly to the control of the bleeding from them, and ought not to be delayed if the symptoms of loss of blood are increasing. It should be undertaken before exsanguination has proceeded far enough to make the additional shock of the necessary operative procedures a source of serious danger.

Hemorrhage from the liver may be stopped by gauze packing or by deep sutures; the cautery is useless.

The liver and its ducts are most accessible through incisions of the abdominal wall, made parallel with the margin of the costal cartilages; but it may be necessary to cut through the latter, or even to approach the liver through the pleural cavity and diaphragm.

Wounds of the gall bladder are to be sutured; in only the rarest cases is extirpation indicated. Incomplete divisions of any of the ducts should be closed as far as possible by suture, and in any case adequate provision for the escape of bile should be made by means of gauze packing.

In a case of complete division of the common duct, if approximation of the severed ends by suture seems impracticable, anastomosis between the gall bladder and intestine is clearly necessary.

2. The Spleen.—The deep-seated position of the spleen in the abdomen makes injuries of this organ relatively rare. Its injuries are the result of much the same sorts of violence as produce lesions of the liver. Of Edler's* 160 cases, 83 were subcutaneous, 42 were bullet wounds, and 35 were stabs.

It goes without saying that an enlarged spleen is much more liable to damage than one of normal size.

The intimate relation of the spleen to other abdominal (and thoracic) viscera makes associated injuries of these organs of frequent occurrence.

The great danger in injury of the spleen itself is from hemorrhage.

Suppuration and abscess of the spleen have been known to follow even subcutaneous injuries of the organ.

The prognosis is therefore grave. Of the subcutaneous injuries, Edler estimates that 86.7 per cent. are fatal; of the shot wounds, 83.3 per cent. The presence of associated injuries adds greatly to the dangers of the situation and increases the mortality.

The treatment of injuries of the spleen is chiefly directed to the control of hemorrhage. It should therefore be carried out at the earliest possible moment. The spleen is easily reached through an incision carried from the free border of the costal cartilages vertically downward through the outer margin of the rectus muscle. For relatively small wounds or ruptures of the spleen deep sutures may be used to stop the bleeding, but for more extensive injuries one should proceed without delay to extirpation.

3. The Kidneys and Ureters.—Contusions of the kidney occur not infrequently as the result of violence acting upon the loins in the form of kicks, blows, and falls. The lesion, in the mildest cases, consists in small subcapsular lacerations or in more extensive tears, particularly at the bases of the pyramids, while in the most severe cases the kidney is ruptured, split into two or more fragments, or reduced to pulp.

* Loc. cit.

Bleeding from the torn kidney tissue is apt to be profuse, and the extravasated blood infiltrates the retroperitoneal tissue or finds its way into the peritoneum if rents of this membrane are also present.

Wounds of the kidney are rare in civil practice, but they present in themselves no anatomical peculiarities that distinguish them from the subcutaneous injuries.

Repair of traumatic lesions of the kidney occurs with great readiness and completeness. Rarely, cysts persist at the site of injury or the kidney goes on to atrophy.

The danger to life in injury of the kidney lies first in the hemorrhage and then in suppuration. But the close relation of this organ to other viscera makes associated injuries of one or other of them of frequent occurrence, and thus the prognosis may be greatly modified.

Of 108 cases of contusion of the kidney collected by Grawitz,* 50, or 46.3 per cent., were fatal. Of these 50 cases, 18 were complicated by injury of more important viscera; in 17, suppuration occurred, with 7 deaths. Of the 32 uncomplicated cases, 14 died of the primary hemorrhage, 8 of secondary hemorrhage, 7 of suppuration, and 3 of urinary retention.

Of 50 cases of stab wound of the kidney, 15 were complicated by injuries of other viscera, 35 were uncomplicated. Of the 35 uncomplicated cases, 11 died—1 from primary bleeding, 1 from secondary hemorrhage, 6 from suppurative nephritis of the injured kidney, 2 from suppuration of the uninjured kidney, 1 not stated. Of the 15 complicated cases, 8 were complicated by injury of the spine, and all died; 1 by laceration of the peritoneum, fatal; 2 by injury of the liver, both died; 3 by injury of the intestine, 2 died; 6 by injury of the chest, 4 died; thus 12 died and 3 recovered.

Of 50 bullet wounds of the kidney collected by Edler,† 22 died. Of the 50, but 20 were uncomplicated by injuries of other viscera, and of these only 3 died.

Injuries of the ureter occur infrequently, most often perhaps as accidents in operations upon the pelvic viscera. Extravasated urine collects behind the peritoneum, exciting a cellulitis there, or it enters the peritoneal cavity and produces a fatal peritonitis.

The treatment of injuries of the kidney turns upon the control of bleeding, upon the provision for the escape of extravasated urine, and upon the avoidance of infection.

In contusions, therefore, if catheterism is practised at all, it must be done with every care to avoid introducing infection. For the less severe cases rest in bed is all that is required. For the more severe cases no delay is to be allowed in temporizing with urinary astringents, cold enemata, etc.; the kidney should be exposed and the bleeding controlled by suture, by gauze packing, or by partial or total nephrectomy. The external wound must be freely drained.

4. **The Bladder.**—The position of the bladder behind the symphysis renders injuries of this viscus fairly infrequent. Whether the wound be subcutaneous or open, the presence of the peritoneum over a portion of the bladder wall is of capital importance, and it is convenient therefore to divide injuries of the bladder into two groups—extra- and intraperitoneal.

Of the *intraperitoneal injuries* of the bladder, wounds may occur in any position, while the subcutaneous injuries or ruptures are usually transverse or oblique, of variable size, and occur oftenest low down in the posterior wall, and least often at the summit. They are usually due to blows or falls upon the hypogastrium, especially when the bladder is distended and the abdominal walls are lax.

There is free bleeding from the bladder lesion and escape of urine into the peritoneum; and sooner or later, generally within two or three days, a peritonitis is produced that, once established, has no tendency to remain circumscribed, but spreads and is regularly fatal. The promptness with which peritonitis develops depends in great measure upon the character of the extravasated urine and upon the presence or absence of infection introduced from without by instrumentation.

* Arch. f. klin. Chir., Heft 2, 1887.

† Loc. cit.

The *extraperitoneal injuries* occur in the anterior wall of the bladder, and vary in size from mere punctures to considerable rents. They are due to much the same sort of accidents that cause intraperitoneal injuries, and are not infrequently the result of fracture of the pubic bones, in which accident fragments are displaced and perforate the bladder wall.

In these cases there is also free bleeding and an escape of urine into the cellular tissue of the prevesical space and into the subserous connective tissue; and, as a result of this, cellulitis develops in these tissues, and is practically always fatal.

As to the relative frequency of extra- and intraperitoneal ruptures of the bladder, the latter are much more numerous, being estimated by Fenwick* at 88 per cent., as against 12 per cent. for the former.

The prognosis of injuries of the bladder, even if uncomplicated by injuries of other viscera, is always most grave. Bartel† has collected 504 cases with a general mortality of 45 per cent. Of these, 373 were extraperitoneal, with a mortality of 20 per cent., and 131 intraperitoneal, with a mortality of 99.2 per cent.

Arranged according to the presence or absence of an external wound, 169 cases were subcutaneous injuries and 90 per cent. died, while 335 were open injuries and 22.7 per cent. died. Of the 169 subcutaneous injuries, 131 were intraperitoneal, with a mortality of 99.2 per cent.; 38 were extraperitoneal, with a mortality of 58 per cent. Of the 335 open injuries, 50 were stab wounds, with a mortality of 22 per cent.; 285 were bullet wounds, with a mortality of 24.5 per cent.

But these figures do not indicate the present mortality rate, which has undergone marked improvement with the advance of aseptic technique and the general adoption of earlier operative interference. Thus Schlange‡ has collected 32 cases, with 15 deaths and 17 recoveries. Of these, 22 were intraperitoneal with 10 recoveries, and 10 extraperitoneal with 7 recoveries.

The treatment of injuries of the bladder is designed to provide for the escape of urine and to close the bladder lesion itself, thus preventing infiltration of urine and the development of those inflammations which otherwise follow, and which are the immediate cause of death.

Suprapubic cystotomy, then, should be done at the earliest moment possible. In extraperitoneal injuries the lesion should be closed by suture, wholly or in part, Retzius' space should be thoroughly drained by gauze packing, and the bladder itself should be drained by a perineal tube.

In a case of intraperitoneal injury the abdomen should be entered just above the bladder, and thoroughly flushed, and the bladder itself should be closed by appropriate suture; a Mikulicz drain being passed into the depth of the pelvis and the bladder being drained by perineal tube.

If the ureter has been severed the divided ends may be brought together by the method of Hochenegg or of Kelly, or the kidney may be removed. Implantation of the ureter into the intestine is a hazardous expedient, as is also implantation into the bladder.

5. **The Gastro-Intestinal Tract.**—Injuries of the stomach occur less often than those of the intestine, and injuries of the large intestine are less frequent than those of the small. They may be single or multiple. Such injuries vary in extent, being either incomplete (involving only one or two of the layers of the tract) or complete (involving all of them).

The former group includes those cases in which the mucous membrane is lacerated by foreign bodies passing through the canal; those in which the intestinal wall is contused by violence acting from without, and in which the injury is accompanied by hemorrhage between the component layers of the intestine, and those in which there is laceration of the peritoneal or peritoneo-muscular layers.

Such injuries are relatively unimportant. Perforation

* Duplay et Reclus: "Trait. de Chir.," vol. vii., p. 866.

† Deutsche Chir., Lief 52, p. 67.

‡ Quoted by König, vol. ii., p. 140.

may be a consequence, but it probably occurs very infrequently. The complete lacerations are the important ones. They are of variable extent. In the stomach the lesion may be a minute perforation or a tear several inches in length; in the intestine also the injury may be a small puncture or a total transverse division of the bowel. There is more or less hemorrhage from the margins of the injured spot into the canal and into the peritoneum, and, most important, there is likely to be an escape of the contents of the intestine, the amount varying according to the dimensions of the opening.

The consequence may be either a peritonitis of small and limited extent, resulting substantially in nothing more than adhesions; or a circumscribed peritonitis, with abscess of greater or less size; or a generalized septic peritonitis.

In the smaller lesions, at least, extravasation of intestinal contents does not occur at once on the infliction of the injury, for one commonly finds, in operations done for bullet wounds of the intestine, that for some hours the opening is occupied and practically occluded by prolapsed mucous membrane. The mechanism of this occlusion was studied by Griffith,* who found that in transverse wounds of one-third of an inch in length, the mucous membrane is extruded by the contraction of the longitudinal fibres of the intestine, and that in small longitudinal wounds the contraction of the circular fibres causes the margins of the wound to roll in, expresses the mucous membrane, and produces the same occlusion. Such obstruction to the escape of intestinal contents is best seen in the small intestine, as it does not occur in the relatively thinner-walled parts of the colon.

Injuries of the gastro-intestinal tract result from contusions of the abdomen due to blows, falls, kicks, etc., which crush the intestine against the spine; and if this part of the canal happens to be distended when the injury is inflicted, an actual bursting of its walls may result. Penetrating bullet and stab wounds of the abdomen are a common cause of injuries of the intestines, and the latter may also result from the passage of a foreign body through the intestinal tract.

The prognosis is always grave and the chief danger is peritonitis. But the development of peritonitis varies with the extent of the lesion, with the ability of the patient to circumscribe peritoneal infection by forming adhesions, and with the promptness with which surgical intervention is undertaken.

According to Petry,† of 199 cases of rupture of the intestine, 4.8 per cent. recovered through the development of adhesions to neighboring structures; in 8.5 per cent. a circumscribed fecal abscess formed. The general mortality of ruptures of the intestine was 86 per cent.; of ruptures of the stomach, 80 per cent.

The seriousness of wounds of the gastro-intestinal canal will appear more clearly when I state that they are specially apt to be multiple and that other organs are apt to be wounded at the same time. Of 4,958 cases grouped by Coley,‡ the mortality was 81 per cent. Of 165 cases treated by operation the mortality was 67.2 per cent.; and of these, 81 concerned the small intestine (mortality, 67.5 per cent.); 24 the stomach (mortality, 75 per cent.); 36 the colon (mortality, 66.6 per cent.).

The treatment should be undertaken at the earliest moment. But here there is not the positive indication for instant operation that exists when the control of hemorrhage is the object in view. Nevertheless there should be no unnecessary delay in intervention, and the guide to the time of operation lies in the degree of shock present. The rule should be to operate the moment the general condition of the patient will admit of the procedures necessary, and before peritonitis has developed. In fact, after a peritonitis is under way and is spreading, no surgical measure is likely to be of avail in any but the most exceptional cases.

The lesions are to be sought systematically, and any

* Quoted by König, vol. ii., p. 143.

† Ibid., p. 144.

‡ Am. Jour. Med. Sc., March, 1891, p. 243.

existing tears should be closed by some one of the recognized forms of intestinal suture; or the intestine should be resected, or anastomoses should be made. Then the neighboring peritoneum should be cleaned; or the entire peritoneal cavity should be flushed until it is perfectly clean and then should be sponged dry. In most cases the judicious placing of gauze drains will be advantageous.

6. **The Mesentery and Great Blood-Vessels.**—Injuries of these structures are exceedingly uncommon in subcutaneous injuries of the abdomen, but they occur with some frequency as the consequence of penetrating wounds. The great danger entailed is from hemorrhage, which is considerable in wounds of the mesentery even of small size, while in those inflicted at the root of this structure or involving one or other of the named branches of the aorta or vena cava, the bleeding is profuse and usually quickly fatal. Treatment, if available at all, is practically so only in those cases in which the wound involves the smaller vessels, which may be clamped and ligatured, or surrounded by suture, and so closed.

SYMPTOMS.

To arrive at the proper conclusion in estimating the consequences of abdominal injuries it is essential to study the individual case from every point of view, beginning with the history of the injury itself, the degree of violence exercised, the attitude of the patient at the time of the occurrence, and the state of his abdominal viscera—empty or full, normal or diseased. Then, besides, one must note the sequence of symptoms, both the addition and the disappearance of local evidences, and the general condition of the individual considered as a whole.

Of the general symptoms, shock is apparent from the beginning in most cases of abdominal injury, although it varies in degree. It is most profound after severe contusions, and may be but slightly developed in a considerable number of cases of penetrating wounds of the abdomen, so that the absence of very marked shock should not be construed to mean absence of visceral lesions of serious or even fatal character; although profound shock must usually be interpreted to be indicative of grave injury.

The symptoms of hemorrhage are practically identical with those of shock, but they are gradually developed; and very often the similarity of the symptoms of the two conditions makes their distinction impossible, at least with any degree of certainty.

Peritonitis at its outset, which may occur within a few hours of the reception of an injury, sometimes closely resembles the symptoms of shock or hemorrhage, but when fully established it can hardly be mistaken for any other condition.

There are certain local symptoms which appear after injuries of any of several viscera, and there are others which are peculiar to lesions of special viscera alone.

Hemorrhage in any volume from the liver, spleen, or kidney,—extra- or intraperitoneal,—or from the mesentery, is accompanied by great pain, by distention of the abdomen, by great rigidity of its walls, by dullness in the flanks in some cases; but by no means all of these symptoms are present in every case in marked degree, and often one or more of them are absent altogether.

The presence of gas in the peritoneal cavity is indicated by loss of liver dullness and by a peculiar, non-resistant feeling of the abdominal wall on palpation and percussion. Here, again, exceptions are numerous in both the positive and the negative sense. Perforations of the intestine occur without loss of liver dullness, and liver dullness may be absent without perforation of the intestine.

Distention of the abdomen following injury is usually evidence of peritonitis.

Pain is often experienced at the site of injury, but is a better index of the location of injuries of the abdominal wall than of visceral injuries; it may be entirely absent or may be referred to another region, and is of little