LECTURES

ON THE

PRINCIPLES OF SURGICAL DIAGNOSIS:

ESPECIALLY IN RELATION TO SHOCK AND
VISCERAL LESIONS.*Delivered at the Royal College of Surgeons of England.*

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LECTURE IV.—LESIONS OF THE ABDOMEN.

The Construction and Functions of its Walls.—Lesions of the Diaphragm.—Contusion of the Abdominal Walls.—Concussion and Contusion of the Abdominal Viscera.—Shock and other Symptoms.—Vomiting.—Hæmorrhage.—Tympanitis.—Peritonitis.—Muscular Lesions.—Wounds of Parietes, lacerated and penetrating.—Conclusions.—Comparison with similar Injuries to the Head and Chest.—Results of Penetrating Wounds.—Contrast in the Pathological Consequences of Traumatic Inflammation in the different Serous Membranes.

MR. PRESIDENT AND GENTLEMEN,—The special adaptation to their several functions which is observed in the skull and the chest, likewise characterises the walls of the abdomen in their relation to the contained viscera, and also indirectly to those of the thorax. The capacity of adjustment to varying degrees of distension of these organs, and the faculty to exercise active compression, are the most important of their functions; and these attributes are not only compatible with, but assist importantly in, free movement of the spine, in the various inflexions of the body. Yet these conditions, and others of secondary importance, entail a certain amount of exposure to injury, which is due to the intrinsic properties of the abdominal parietes, and to the accommodation of their structures to the passage of various textures into and out of the cavity; the walls are weakened at such points; and this circumstance is instrumental in permitting a class of lesions, for the relief of which the surgeon's interference is frequently claimed.

The complicated apparatus employed in the assimilation of food resides principally within the abdomen; the vascular supply of the organs thus employed is abundant; and their innervation is derived chiefly and specially from the cyclo-ganglionic system. The muscular parietes of the containing cavity are under the guidance of volition; but the motor power of the viscera themselves, with the exception of the urinary bladder, is derived from the scattered nerve-centres which abound in this region. The solid and part of the membranous organs are, comparatively, though not absolutely, fixed in their several positions; but the greater length of the bowel is loose and moveable, varying, to a certain extent, its relations according to its exigencies. Yet, even the relatively fixed viscera accommodate themselves to encroachment, dependent on temporary distension or permanent enlargement of neighbouring organs; and it is remarkable to what an extent this may take place without serious disturbance of function, as demonstrated in ovarian and other tumours.

Forming the roof of the abdomen and the floor of the chest is the musculo-membranous septum, the diaphragm. Each surface of the muscle is covered nearly throughout by a serous expansion; and the central aponeurosis has closely adhering to its upper surface the fibrous layer of the pericardium. These relations and connexions are most important in the diagnosis of lesions in this region; for a penetrating wound, of even very moderate depth and of but slight obliquity, may involve the liver and lung, and possibly also the pericardium and heart, in its progress. From such wounds the anterior wall of the abdomen offers but little protection; but they are infrequent, happily, in our country, as they very rarely occur except as the act of the assassin, or, occasionally, of the suicide. The same lack of protection is apparent in abdominal contusions; yet the gravity of these is often mitigated by the yielding nature of both parietes and viscera. It should be remembered, however, that those membranous organs which are most liable to periodical states of distension are most protected, such as the stomach in the hypochondrium, and the bladder in the pelvis.

Injury of the diaphragm, by rupture or wound, is not of frequent occurrence. From time to time, after severe and speedily fatal mischief by compression of the abdomen, we meet with such lesions in our

hospital *post mortem* rooms. The passage of a heavy wheel over the waist, crushes the ribs and forces part of the abdominal contents into the chest; but we rarely have an opportunity of witnessing, during life, a condition which can be diagnosed as rupture of the diaphragm.

In my second lecture I narrated a case in which there appeared to be conclusive evidence that a knife had been thrust through the diaphragm, and both the liver and lung seemed to be implicated in the injury; but the position was such as to prevent the intrusion of the contents of the abdomen into the chest, and to render the muscular lesion a feature of minor importance. In rupture of the diaphragm on the right side, no hernial intrusion into the chest could occur, unless the rent be large, as the liver would be an effectual barrier against such result.

In rupture on the left side, hernia is a very probable consequence; and the physical constitution and relations of the thoracic and abdominal viscera necessitate the intrusion of the latter into the cavity of the former; for the arched tension of the diaphragm is a necessary condition in respiration: when this is spoiled, the lung is no longer distended; but the space is occupied, when the chest is expanded, by the viscera nearest to the rent; and the lung, therefore, cannot descend into the abdomen.

The diagnostic signs of such an injury would be obscure, and would vary according to circumstances. Pain and dyspnoea would be present; and the physical signs, by auscultation and percussion, must depend upon the nature and extent of the hernia. If the stomach be thrust upwards into the thoracic region, as occurred in a case of large abdominal cyst resulting from injury, which I shall relate in a future lecture, there would be even abnormal resonance at times in this region; or there would be dulness, if the stomach (or colon) were distended with solid contents. The preparation I have on the table, which is from the museum of St. Thomas's Hospital, exemplifies this class of cases.

A patient, about fifty years of age, who had formerly been a railway porter, was admitted into the hospital in May 1862, with fever, and died, with pulmonary complication, in three or four days. It was noted, during his treatment, that there was entire dulness on percussion in the left dorsal and lateral regions, with bronchial respiration. The *post mortem* examination showed the results of broncho-pneumonia on the right side, and revealed the following remarkable condition on the left. The lung was very much collapsed, reduced to a small size, and displaced to the upper and posterior part of the pleural cavity, and attached by firm adhesions to the parietes. The transverse and descending colon, and a very considerably enlarged and softened spleen, were also lying in the left pleural cavity, with a large proportion of the small intestines, which had escaped from the abdominal cavity through an aperture in the tendinous portion of the left side of the diaphragm, sufficiently large to allow the hand to pass through. The abdominal cavity contained only the lower portion of the ileum, the cæcum, with portions of the ascending and descending colon and its sigmoid flexure, in addition to the glandular viscera. The stomach was entirely above the diaphragm, and occupied the posterior and lower part of the left thoracic cavity. The kidneys and liver were not disturbed from their natural position. (See wood-cut, next page.)

The antecedents of this patient did not allow of a very reliable history of his previous life being obtained: but a woman, with whom he had been recently living, stated he told her that, about two years and a half since, whilst employed on a railway, he had been squeezed between the buffers of two carriages. He suffered acute pain and great difficulty of breathing for some time afterwards, but had no medical advice; and—I do not say *propter hoc*—soon recovered from the immediate effects of the injury. But he appears to have been the victim of physical depression, to relieve which he had recourse to drink, and became a confirmed drunkard. His general health appeared, from the account given, to be deteriorated; and he became dyspeptic, and suffered from continual thirst, which induced him to drink a large quantity of water, in addition to the strong liquors which he imbibed.

In some of the recorded cases which I have met with, where the patients have survived sufficiently long, the symptoms were not of a character to enable the medical attendant to diagnose the nature of the lesion: and some of the patients have died suddenly—probably from spasm or paralysis of the injured muscle. The following doubtful case, under the care of my friend Mr. Solly, exemplifies the difficulties attending the diagnosis of this injury, where recovery takes place.

A. C., aged 29, had two ribs on the left side fractured by direct violence. The injury was immediately succeeded by great dyspnoea and almost fatal syncope. He rallied after some hours; but on the evening following the day on which the accident happened, there was secondary collapse, which suggested to his attendants that there had been internal hæmorrhage. The other early symptoms were, a burning sensation in the epigastrium, general distress, and abdominal respiration. On examining the chest, it was found that the breath-sounds were absent on

the left side at its lower part; whereas, on percussion, this part proved to be very resonant. The heart was thrown over to the right side. The inference drawn, by the medical attendants, from these physical signs was, that the diaphragm had been ruptured, and that the stomach had entered the chest. In two months the heart had resumed its normal position, and the lung its healthy function. It was contended, on the other hand, and I think with much show of reason, that entire recovery from so serious a lesion, and in so short a time, is inconsistent with our acquired knowledge on the subject; and that this case must have been one of pneumothorax, limited by adhesions of the pleura.

The recent condition of the parts involved was well illustrated in a case of which I have a record—the patient dying soon after his admission into the hospital. A large quantity of blood was found in the left pleura; and the diaphragm was torn on the same side, to an extent sufficient to admit through the aperture the entire stomach and the left lobe of the liver, which occupied part of the left pleural space. The lung was correspondingly compressed, and the heart was so displaced as to be thrown to the median line above its normal position.

A similar condition prevailed in another recent case, the injury resulting from the passage of a waggon-wheel over the chest, and the patient surviving only two hours. The left pleura contained a quantity of fluid-blood, and a large rent in the left muscular portion of the diaphragm extended into the pericardium. In this instance the stomach, spleen, a considerable portion of the transverse and descending colon, with some omentum, were in the left pleural cavity. Hæmorrhage, in these cases, combined with obstructed respiration, was apparently the immediate cause of death. Of the instances which I have on record, the left side of the diaphragm was usually the seat of laceration.

I am tempted here to narrate a singular and interesting case of injury specially affecting the muscles of respiration, and dependent on contu-

sion of the nerves directly associated with this act. It did not occur under my own observation, but the notes were kindly supplied to me by my friend and former pupil Mr. Wagstaffe, who attributes the symptoms to contusion of the phrenic nerve.

T. F., aged 23, received a kick on the right side of the neck over the anterior edge of the sterno-mastoid in its lower third, about an hour and a half before he was visited. When seen, he was suffering from urgent spasmodic dyspnoea, could not speak, had constantly recurring spasms, with temporary cessation in breathing, the diaphragm being visibly contracted spasmodically during each attack of apnoea. In the intervals between the attacks he was quiet; and, after taking some hot stimulant, could speak between the paroxysms, which were not diminished in frequency. The attacks were ushered in by a dreamy state of expression, gradually merging into complete cessation of respiration. The injury had been directly over the right phrenic nerve, but there was no bruising here of the surface, and there was no evidence of injury to the large vessels, the circulation being normal in the arteries beyond. The heart's sounds were healthy; pulse fair, at 96; there was some difficulty in swallowing, and tenderness on pressure over the seat of injury.

Early on the following morning, the convulsions were renewed with increased severity, threatening to cause death by asphyxia. Pulse weaker; surface colder; pupils sluggish. He was relieved by morphia and chloric ether, with mustard to the nape and feet. Later in the day, he had numbness in the right hand and arm, succeeded by a sensation of "pins and needles." This soon passed away; and from that time he rapidly mended, without further relapse, and was well in a few days. The last attack of dyspnoea was on the fourth day; and dysphagia remained as the latest evidence of the injury.

Such a case as the above is, of course, open to much speculation. Probably the nerve-injury was complicated, and both the pneumogastric and sympathetic may have been involved in the production of the symptoms, as there seemed to be a lack of intelligence between the lungs and the excito-motor centre, centripetally, as well as a convulsive action of the muscles of inspiration, and of those commanding the aperture of the air-tube.

In consequence of their readily yielding to pressure, contusion of the abdominal walls is not accompanied often by circumscribed extravasation of blood; a condition which is so frequent in the gluteal region as a consequence of falls or blows. Over the pubes we occasionally meet with such blood tumours, but rarely higher up in the abdominal wall. Extravasation not infrequently presents this character in the labia of the female; but in the male, when the scrotum is contused, the effusion assumes usually the character of diffuse ecchymosis.

Contusions of the abdomen, although unattended by any organic lesion, are often characterised by an amount of shock, which can be accounted for only by the impression made on the contained viscera. In many instances, so profound is the attendant collapse, as to suggest a mortal injury; and in some cases I venture to affirm that it is impossible to determine, at an early period, whether the patient be the subject of visceral lesion or not; in some few cases this doubt may not be solved until after the lapse of two or three days; and occasionally the uncertainty is indefinite. The shock of which I speak must not be confounded with the faintness and depression which result from internal hæmorrhage. In the latter class of cases, the patient usually refers his suffering to some isolated spot, where fulness, or dulness on percussion, or both, may be detected. Shock, from simple contusion, may, as I have remarked, remain masked; *i.e.*, retain the characteristics of the same condition resulting from organic lesions for forty-eight hours or longer; for the reaction following these injuries is sometimes deferred, and rarely proportioned to the previous amount of depression. Moreover, the belly not infrequently becomes tympanitic and tender, without the development of peritonitis. The impression made on the great cycloganglionic nerve-centres explains the profoundness of the collapse in abdominal injuries, as compared with similar lesions of organs in other regions; the appeal is specially and directly made to the system of nerves which controls the functions of organic life, which are, therefore, primarily affected. In the earlier stages of these lesions, I am unacquainted with any diagnostic sign by which we may predicate whether shock exists primarily, apart from, or as expressive of, actual breach of texture. The absence of any special indication of local mischief, such as pain, tenderness, swelling, or bloody urine, may be accepted as negative proof, so far as it goes, that the case is one of simple shock; and this perplexity is sometimes enhanced by the early absence of collapse, as I shall have occasion to point out, where the lesion is organic and of a character even to prove speedily fatal. Time alone, in such instances, can develop the true nature of the case, either by renewal of vigour, with restored circulation, or by the development of fresh symptoms, if

the patient survive to the stage of reaction. Happily the diagnosis, in these circumstances, does not influence our early treatment. Caution in the use of stimulants, entire repose, both muscular and visceral, together with warmth to the surface, and evacuation of the bladder with a catheter, is the safe expectant treatment whilst doubt still hangs over the nature and extent of the injury; the subsequent management of each case must be guided by symptoms as they arise. I will now briefly exemplify the above remarks.

A child, seven years of age, was admitted under my care, having been run over by a cart, both wheels of which passed over the chest and abdomen. He was pulseless, and in profound collapse. On the following day, the abdomen became tympanitic but not tender. Moderate reaction was succeeded by convalescence; and the child left the hospital well, after six days.

A navvy was wheeling a barrow down a steep plank, when he fell, striking his abdomen against the handle of the barrow. He was admitted in a state of collapse, but there was no positive sign of ruptured viscus, although there was an ecchymosis where the blow was received. He soon recovered, and had scarcely any abdominal tenderness at any time.

A boy, ten years of age, was admitted after the wheel of an omnibus had passed over his abdomen. The shock was considerable, but not attended with insensibility. There were no marks of contusion. He had dyspnoea, and complained of great pain and tenderness in the iliac region, where there was dulness on percussion, extending half way to the iliac crest. His intelligence was impaired, suggesting the probability that his head had been injured. He rallied slowly, but was able to leave the hospital at the end of the third week.

In the former two of these cases, the condition was one of simple shock from abdominal contusion, from which the patients quickly rallied; in the latter there was, apparently, extravasation of blood and the further complication of some injury to the head; but there were no indications of serious visceral lesion in the abdomen.

The occurrence of vomiting in these cases of simple abdominal contusion is not constant; and its presence, when persistent, is suggestive of some organic lesion. Yet, in some instances, I have known repeated vomiting and a protracted state of semi-consciousness followed by slow recovery. Occasionally, in abdominal contusion, a relapsing state of collapse will occur, which naturally excites alarm, as it may usher in more serious symptoms indicative of lacerated viscus; but this cause of anxiety may also pass away, and a healthy reaction may be established. In some instances the convalescence is deferred and more protracted; and a doubt may still remain as to whether any visceral lesion actually existed. As I have already remarked, I know of no diagnostic sign by which this suspicion may be supported or verified, except the presence of local pain, dulness on percussion, bloody urine, or some disturbed function; but even these can scarcely be regarded as conclusive, when the patient recovers, as I shall endeavour to exemplify presently. On the other hand, more or less general peritonitis may follow contusion without lesion; but this complication is, I think, rare; and the recovery of the patient is no proof that such lesion was not present, for the acuteness of the symptoms is not necessarily a measure of the severity of the organic injury. The following cases briefly illustrate the foregoing remarks.

A middle-aged man was struck on the abdomen by the handle of a crane. He immediately became sick and faint, and, when admitted into the hospital, was in a state of extreme collapse, and complained of acute tenderness over the abdomen. His water was drawn off untinged with blood. On the following day he vomited whatever he took, and complained of great tenderness over the abdomen, not localised at any particular spot. On the third day he was somewhat improved, but solid food was still vomited, however light its character. This patient rallied very slowly, and continued to suffer much pain and tenderness in the belly. He had fits of vomiting at intervals, and was much prostrated; but the pulse always remained quiet. He left the hospital after six weeks' perfect repose, still much enfeebled. In this instance the local signs of peritonitis were present, but the circulation was never excited; and I felt it impossible to affirm that there was no organic lesion inflicted. The succeeding case exemplifies other features, but belonging to the same category.

A young man of twenty, was knocked down by a horse on to a railway, in front of some carriages which were in motion down an incline; he was thus squeezed before the wheels for some five or six yards, and had the right side of his chest and abdomen severely contused. On admission, he was in a state of extreme collapse, and vomited. I examined him carefully, but detected no fracture either of the chest or pelvis. He rallied during the night, but became again extremely prostrated on the following day. His breathing was chiefly thoracic and short, but he referred his suffering to the abdomen, and especially to the hypogastric region. He was able to micturate naturally, and his water was clear.

On the third day he was sick; tongue coated; skin hot; pulse quick and hard; respiration rapid. On the fifth day, the report states that the pulse rises and falls without apparent cause; complexion sallow; conjunctiva tinged yellow; abdomen distended. Shortly after this he began to rally, the yellow tinge of the complexion abating, and the abdominal distension subsiding. The right hypochondrium continued tender for some time, and his tongue was foul. The treatment was confined to gentle aperients after the first few days; he left the hospital at the end of three weeks. Some of the symptoms in this case suggest hepatic lesion, but the patient's early recovery seems scarcely consistent with that belief; though I may remark that it has come within the sphere of my observation to know that superficial lesions of the liver heal very quickly.

The immediate consequences of abdominal contusion vary from transient shock to profound and fatal collapse. Cases of the latter class are recorded, but I have never examined one *post mortem* which was unaccompanied by organic lesion. It is difficult to assign this fatality to its true cause, further than by surmising that, as in similar injuries in the cervical region, the functions of the organic nerves are irrecoverably suspended; and there is nothing unreasonable in the supposition that such is the case, when we consider how profound and protracted such collapse sometimes is, accompanied by pulseless unconsciousness, and every evidence of the low ebb to which vitality is reduced in both organic and animal functions. For an obvious reason, these instances of sudden death are not often brought under the notice of the hospital surgeon; and when they occur, they are probably due to some complicating cause, such as feeble health, strong mental emotion, or, possibly, some pre-existing organic deterioration or disease. Indeed, I may refer to the remarks which I made in my former course of lectures, when speaking of the possibility of death resulting from cerebral concussion, without organic lesion. In such cases, if they occur, doubtless shock, communicated from the cerebro-spinal to the ganglionic nerve-centres, is the cause of death. So, in the more direct appeal to the latter in abdominal contusion, the brain is secondarily affected; and in either the result is, perhaps, determined by some accidental coincident, or antecedently existing condition, by which vitality is depressed below its normal standard.

In cases of severe abdominal contusion with shock, I have generally noticed the occurrence of *tympanitis*, accompanied by constipation of the bowels, as a sequence. To what is this due, assuming that there is no visceral lesion? My conviction is that it is referable to the injury inflicted on the ganglionic nerves. The shock sustained by the nerve-centres of this system produces temporary suspension of their active function; and paralysis of the peristaltic movement of the intestines is the consequence.

The concurrence of *hæmorrhage* with shock, as a consequence of abdominal contusion, is usually indicative of more or less serious visceral lesion; I mean that hæmorrhage rarely occurs except from some lacerated or ruptured viscus. Yet such injury is by no means necessarily fatal. The complication in question is one which it is impossible to distinguish with certainty from simple shock in its early stage; for even protracted semi-consciousness and acute local pain may be present without either hæmorrhage or organic lesion.

Local peritonitis, as a sequence of abdominal bruise, is not very uncommon; *i.e.*, if we may accept the evidence afforded by topical pain and tenderness, with febrile excitement, as a proof of such effect, in the absence of more positive signs of visceral injury. But *general peritonitis* consequent on contusion is, in my experience, rare; its presence, therefore, may be regarded, in most instances, as highly suggestive, though not positively conclusive, of organic lesion.

I have a record of one case in which a middle-aged man was knocked down in a crowd and trampled on. He survived three days, with a distended and tender abdomen, and constant vomiting. His breathing was thoracic, and he never rallied from the shock caused by the abdominal contusion. The peritoneum contained three pints of turbid fluid, and some traces of lymph; but there was no visceral lesion. These cases are rare; and the injury, in this instance, was peculiar.

Retention of Urine usually accompanies this class of cases, but the bladder generally recovers its tone as the symptoms of shock subside. In fact, this condition, as well as sleeplessness and indifference, or restlessness, are to be regarded rather as indicative of shock, *per se*, than of shock specially associated with abdominal contusion.

Muscular Laceration from abdominal contusion, but without cutaneous lesion, is occasionally met with. Such instances are, however, infrequent and exceptional. Rupture of the rectus may, at any early period, puzzle the surgeon; but afterwards becomes apparent from the depression bounded, above and below, by the retracted fibres of the severed muscle. The history of the accident will also assist in the diagnosis of these cases. In an instance which recently came under my notice, this injury occurred in a female in whom the recti muscles were previously separated, allowing of partial protrusion of the central viscera.

Lesion of texture in the abdominal walls may present all the varieties of such injuries in other parts; they may be either incised, contused, lacerated, or punctured wounds. The special interest of such cases is dependent entirely on the doubt which must, in most instances, exist as to the probability of the contained viscera being involved in the injury. Yet, without such implication, these injuries, if severe, are serious, and sometimes fatal. In one case of attempted suicide under my care, an incised wound of the abdominal wall placed the patient in a very critical condition for some time, though it was doubtful whether even the peritoneum was injured. The wound, which was between the ensiform cartilage and the umbilicus, and to the left of the median line, was inflicted with a razor, and the patient suffered from all the symptoms of collapse, followed by abdominal tenderness and fever. He had been induced to commit this act in consequence of acute epigastric pain which had long tormented him. He recovered slowly; and informed me before he left the hospital that he was almost entirely relieved of his pain; this operation had effected a cure.

A singular gun-shot wound of the abdominal wall occurred in a patient of mine some years since. He was climbing a bank and drawing his gun after him, with the muzzle towards his body, when it exploded, and the entire charge of shot was lodged in the epigastric region. I concluded that the patient's condition was hopeless, as he was in a state of profound collapse, and it was impossible to ascertain the extent of the injury inflicted, as there were no special symptoms to guide me. This patient recovered; and I was enabled, at various times, to extract the shot and several fragments of clothing from the large suppurating cavity which remained open for many weeks. The oblique direction which the charge took saved the man's life; for neither of the three serous cavities in the neighbourhood could have been implicated, if I may judge by the negative evidence afforded by the absence of symptoms which would indicate such injury. He was compelled afterwards to wear an artificial support, to compensate for the entire loss of all sustaining textures in the epigastric region, except the skin.

Laceration of the abdominal wall, if severe, is a serious complication in abdominal shock. This occurs occasionally in buffer-accidents, and I have known them to prove fatal, without penetration of the serous cavity.

The abdomen affords no exception to the general rule, that *punctured* wounds are the most serious in their remote, and often in their immediate, consequences. It is scarcely necessary to observe that a penetrating wound in this position must be either very shallow, or its direction very oblique in relation to the plane of the surface injured, for the cavity of the abdomen not to be entered: but the lesion of some one of the contained viscera is not a necessary consequence of such a complication. The obscurity attending the diagnosis of these cases is great, owing to the amount of shock which often accompanies them, and the impolicy of making exploratory examinations for the purpose of settling this doubt. I have already pointed out that the severity of the shock is no measure of the gravity of the lesion, where no wound exists; and, I may add, that its persistence sometimes misleads the surgeon. These remarks apply with at least equal force to penetrating wounds of the abdomen, especially when accompanied with much violence—such as a fall from a high window, and the consequent impaling of the body on the spikes of area railings. These injuries are brought under our notice from time to time in our hospital practice; and I have had some instances under my care in St. Thomas's. One such I have already had occasion to refer to, in illustration of another subject. The following case exemplifies the form of injury I am speaking of, and also demonstrates the obscurity which envelopes the diagnosis of these lesions.

A middle-aged man was repairing a house, when the ladder on which he stood broke, and he was precipitated from a considerable height on to some area railings: two of the spikes, which were conical at the point but not sharp, penetrated the abdomen, and were broken off. One of them was picked up by a looker-on. He had bled freely before he was admitted into the hospital: on admission, he was cold, blanched, and nearly pulseless; and, although restless, appeared almost unconscious of what was going on around him. One spike had entered the abdomen close to the left anterior superior spine of the ilium, grazing the bone to some depth; the other had penetrated about an inch above the umbilicus: venous blood was oozing from each wound. He complained of no pain in the abdomen. On the following day there was sickness, thirst, and tenderness, with some reaction. He survived about sixty hours. The autopsy betrayed scarcely any signs of peritonitis. The spike which penetrated close to the ilium pierced the iliacus muscle, and splintered the subjacent bone. The fragment of the missing spike, four inches in length, was found lying across the rectum: it had pierced the tissues perpendicularly, and indented the third lumbar vertebra, by collision with which it had evidently been broken off. The right iliac vein was torn, from which a large quantity of blood

had been poured into the pelvis; but there was no laceration of any viscus.

In this case the symptoms of loss of blood as well as of shock were present; and the two combined proved fatal. Yet, in contrasting the results of such an accident with others of severe abdominal injury produced in a different way, we are led to the conclusion that accidental concomitant circumstances, and particularly the accompanying general violence, have often an important influence in determining the intensity of the shock. I remember the case of a railway-guard who was admitted into the hospital, having been squeezed between the platform and a luggage-train in motion. The result was extensive separation of skin from the subjacent textures, with limited external laceration below Poupart's ligament, yet allowing access to the interior of the abdomen. But the patient was neither collapsed nor sick when he was admitted. He died on the third day of peritonitis.

In reviewing the observations which I have made on abdominal contusions and parietal wounds, they appear to me to justify the following conclusions.

1. Shock of the most profound character is often the consequence of simple contusion of the abdomen; and the intensity of the symptoms of collapse is no standard by which the nature of the injury can be determined.
2. The continuance of this state of collapse for two or three days is not necessarily conclusive as to the existence or otherwise of organic lesion.
3. Severe localised pain, and even general and continued abdominal tenderness, are not to be accepted as proof of organic injury, and are quite consistent with ultimate, and even with early, recovery.
4. Tympanitis and constipation, from temporary paralysis of the muscular coat of the bowel, are the consequence of shock or concussion of the cyclo-ganglionic nerve-centres.
5. Vomiting generally follows the severer forms of contusion of the abdomen, without reference to the part struck: it is sometimes persistent, but it is not a constant symptom.
6. Retention of urine is a common accompaniment of these injuries; and is usually attended by more or less insensibility to the presence of urine in the bladder.
7. Internal hæmorrhage, as a complicating circumstance, may occur in these injuries, without its presence being ascertained from the early symptoms: but a state of syncope as distinguished from shock, especially if accompanied with local pain and swelling, and dulness on percussion, may be regarded as highly probable evidence that internal hæmorrhage has occurred.
8. Penetrating wounds, especially with blunt implements or missiles, do not necessarily involve textural lesion of any viscus; but they are often fatal, nevertheless; primarily from shock or hæmorrhage, or the two combined, or secondarily from peritonitis.

The concussion, and consequent paralysis, to which the membranous abdominal viscera are obnoxious, is similar to that of which I spoke in a previous lecture as characterising the effects of violence, without organic lesion, inflicted on the lung. In fact, severe commotion (if I may borrow the French expression) of either cerebro-spinal, thoracic, or abdominal viscera, seems to be followed by the same result of disturbed or suspended function. In the head, the centre of volition and sensation is directly appealed to, and the cyclo-ganglionic system is sympathetically affected: in the spine, the excito-motor functions are disturbed in common with those of which the cord is the intermediate conductor to distant parts: in the chest, probably the vaso-motor nerves and centres are directly acted upon: in the abdomen, the larger cyclo-ganglionic centres of this region are implicated. And these results are independent of, or rather superadded to, another disturbance of function which is due to the same cause: defective oxidation of the blood, and consequently suppressed or scanty secretion—especially of the excretory organs, as the bile and urine—under the influence of shock, manifests the interruption to which the functional integrity of this important division of the nervous system is thereby subjected.

In an earlier part of this lecture I alluded to and exemplified some of the difficulties attending the diagnosis of contusions and penetrating wounds of the abdomen, as distinguished from those more serious injuries which implicate the viscera themselves in organic or structural lesion. Indeed, in many instances, this obscurity is enhanced by the absence, for a time, of the symptoms of profound shock which accompany simple contusion or concussion—an apparent anomaly which admits of explanation, as I shall presently point out.

Many circumstances combine to determine the consequences of injuries which lay open the peritoneal cavity without visceral lesion. Some of these are apparent, others inscrutable, probably because de-

pendent on occult predisposing causes, which may be natural and inherent in the individual, or purely accidental. As an exemplification of the apparent caprice which governs the results of incised wounds of the abdomen, I will quote two cases which, no doubt, have their parallel in the experience of most hospital surgeons. I was requested, some years since, by the late Dr. Waller, to assist him in a case of ovarian disease. The period I allude to was that during which tentative operations were performed, in the hope of discovering some means, less fatal than extirpation, for the cure of ovarian tumours. The experiment which Dr. Waller proposed to try was that of inducing inflammation of the adjoining surfaces of a limited portion of the peritoneum, hoping thus to procure adhesion, as a preliminary step to tapping and draining the cyst. I exposed the serous surface of the cyst in the median line to the extent of about an inch, and placed a pledget of lint between the edges of the wound. The patient, a young woman in tolerable health, survived this, in one sense, trifling operation little more than forty-eight hours. She sank speedily in a state of collapse, and without symptoms of any acute peritonitis.

The other instance to which I refer is a case of ovarian tumour, on which I operated about twelve months since. I give an abstract of a narrative of this case, as it was sent by our Registrar to one of the medical journals. The patient was a married woman, thirty-three years of age, in tolerable health: the measurement of the abdomen, at the level of the umbilicus, was forty-eight inches; and the wave, transmitted, on percussion, from side to side, was very distinct. An incision from near the umbilicus to the pubes exposed the tumour, the contents of which were found to be gelatiniform matter of a remarkably tenacious character. One hand alone was almost useless in the prolonged task of emptying the large cyst; it was requisite to introduce both hands simultaneously from opposite sides, and then lock them together, in order to remove, little by little, the firm and glutinous colloid contents, which amounted to upwards of three gallons. Numerous smaller cysts were treated in the same way, and the universal adhesions were broken through all around. The omentum in front, the mesentery behind, the stomach, liver, and intestines, had severally to be cautiously separated. The aorta and iliac arteries were felt pulsating behind the fingers, as they were carried downwards from the abdomen into the pelvis. Ultimately the pedicle was included in a clamp; and, after some bleeding vessels were tied, the ligatures being cut off close, and the pelvis cleansed with a sponge of the fluid which had gravitated into it, the edges of the wound were approximated and fixed with an uninterrupted suture. The patient was under chloroform an hour and a half, vomited at an early period, and respiration ceased on one occasion for a few seconds. The subsequent history of this difficult and therefore tedious case may be included in the simple statement that she had not a single untoward symptom: even sickness did not recur after she was placed in bed, although she had been frequently subject to bilious vomiting previously. She was sufficiently recovered to return to her home twenty-four days after the operation was performed.

So remarkable a contrast in the results of two such different operations, as regards their relative magnitude, suggests many interesting and important considerations, which have a more or less direct bearing on the diagnosis of these injuries. The subject is one to which my attention has been often directed, and to which I shall revert when speaking of the causes of mortality in other operations in the abdominal region.

The frequency of mischief resulting from the exposure of a healthy serous or synovial surface, seems to indicate the remarkable susceptibility of these membranes in their normal condition; but I venture to affirm that the converse is likewise true. Nor is it necessary that morbid action should have altered the organic structure of these textures to produce this effect: it may be noticed even where only inflammation with changed secretion is present, or in congestion consequent on mechanical interference with the circulation; but more especially is the susceptibility of these membranes modified by chronic inflammatory changes in their physical condition and relations, as in the latter of the two cases just narrated. Indeed, this contrasted organic sensitiveness, in the different conditions alluded to, is exemplified generally, so far as I have been able to observe, in the very class of cases to which reference has been made.

I believe, if other accidental and complicating circumstances could be eliminated, that these operations which involve the protracted exposure of the peritoneum are successful in proportion to the changed condition of the serous membrane—its permanent degradation, if I may so term it, below its healthy standard. No doubt the delay, coupled with necessary violence in separating firm adhesions, counterbalance, in a measure, these advantages, especially if any visceral lesion be superadded. But the progressive plastic change, during which, under these circumstances, adjoining surfaces of a serous membrane lose their normal cha-

racter and properties, and by which they become agglutinated together, must not be viewed in the light of a morbid process tending to a mischievous result; and, if gradual, such change is unattended by the symptoms and signs which characterise peritonitis, and does, in fact, often take place without satisfactory evidence of its occurrence, as proved by the difficulty attending the diagnosis, in such cases, of the presence or absence of adhesions. On the other hand, in the healthy membrane it is not possible that its altered secretion—the presence or an excess of the saline ingredients in the outpoured serum, which is induced by exposure to the air or by traumatic irritation—may account for the often sudden and rapid diffusion of inflammation under these circumstances? A somewhat analogous consequence of what may be termed anticipated vascular derangement is witnessed in the temporary action of nitrate of silver on the skin. Erythema may often be circumscribed and arrested by the caustic application, as a spreading combustion may be checked by burning the parched grass of the prairies, although I have never seen any good result from the use of the escharotic in cellulitis: the cutaneous vessels are occupied, if I may so express myself, in the action induced by the caustic, and therefore refuse to take part in propagating the spreading inflammation. But I shall have the opportunity of further exemplifying this interesting subject in my next Lecture.

We are apt to regard organic lesions of the abdomen as almost necessarily fatal; and such, indeed, is very near the truth, with certain conditional reservation, in as far as the membranous viscera are concerned. But probably breach of texture in the solid or glandular viscera is more frequently recovered from than our opportunities enable us to demonstrate. I infer that such is the case, from a comparison of symptoms attending instances of undoubted structural lesion, as proved by *post mortem* examination, with those which I have witnessed in patients who have recovered; and also from the not infrequent evidence which I have observed, when engaged in making autopsies and in dissecting, of antecedent lesion in the liver, as indicated by linear or puckered cicatrices. In other instances, in which the patients have recovered, I have entertained but little doubt, from the attendant symptoms, that the kidney has been the seat of similar laceration or partial rupture.

That laceration of the membranous viscera should be so commonly fatal, is scarcely to be wondered at, when we consider the varied and irritating qualities of their contents, and the great susceptibility to acute inflammation of the serous sac into which they are poured. Rents of the glandular viscera, although dangerous to a more limited extent from the same cause, are often fatal from abundant hæmorrhage—a risk which does not usually attend the former class of lesions. Yet, in many instances, fatal breach of texture in the membranous viscera does not induce sufficient inflammation to be, by itself, mortal: the vascular reaction is not adequate to produce this effect; and we are compelled to view the lesion as, in these cases, operating through the ganglionic nerves. The early prostration is succeeded by an abortive effort at reaction; extravasation of the visceral contents produces renewed collapse; and the patient sinks under the secondary shock thus communicated to the visceral nerves and ganglia, in which, indirectly or by sympathy, the functions presided over by the cerebro-spinal centres are involved. Nature, as I have heard that Mr. Abernethy used quaintly to remark, stands by and shakes her head, and then leaves the patient to his hopeless fate.

That shock to the ganglionic nerve-centres is the explanation of the frequent fatality of peritonitis, would seem to be confirmed by many considerations: for this result is not peculiar to the traumatic, as distinguished from what is usually termed the idiopathic form of the disease. They run very much the same course, and a state of collapse precedes dissolution. The fatality of inflammation in other serous membranes is due either to the entailed consequences, which operate, chiefly mechanically, on the organs they envelope. Thus, the effusion of serum or the deposit of pus within the arachnoid is speedily destructive of life: and in fatal pleurisy, this result, though often deferred, is chiefly due to obstructed function from pressure. The pericardium is no exception to these remarks: for here, likewise, death may speedily ensue from the mechanical compression of copious serous effusion, as manifested by the embarrassment of the heart's action, and all the signs of impeded circulation: or, if the patient survive, the probable occurrence of adhesions induces organic change in the structure and cavities of the heart, which become atrophied and dilated, and are thus rendered incompetent to perform their functions as in health. In the peritoneum, on the contrary, as indeed is partially the case in the pleura, extensive adhesions are not inconsistent with functional integrity; although they sometimes entail, accidentally, serious and even fatal consequences.