LECTURES

ON THE

PRINCIPLES OF SURGICAL DIAGNOSIS:

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

By F. LE GROS CLARK, F.R.C.S.,

Hunterian Professor of Surgery and Pathology in the College; Surgeon to
St. Thomas's Hospital; and Examiner in Surgery at the
University of London.

LECTURE V.—LESIONS OF THE ABDOMEN (CONTINUED).

*Injuries Involving the Abdominal Viscera Generally.—Symptoms: Col-
lapse; Tympanites; Vomiting; Suppression or Retention of Urine;
Temperature; Hemorrhage; Pain; Peritonitis.—Rupture of Particular
Viscera, Membranous and Solid.—Penetrating Wounds Involving
Different Viscera.—Traumatic Cyst in Abdomen.—Fluctuation.—Con-
sequences of Injury to Chest and Abdomen Compared.*

PENETRATING wounds of the abdomen by blunt or sharp instruments are occasionally met with, but not frequently so, in civil practice. A wound of a viscus by a blunt missile, such as a bullet, except when small, very much resembles the condition of a laceration or rupture, and would, in most instances, be denoted by the same indications. I have already referred incidentally to this subject. Recorded instances of recovery, after a penetrating wound of the abdomen with a sharp instrument, are rare; and such fatal result, as the general consequence of wound of intestine, when in communication with the peritoneal cavity, is in accordance with the issue of experiments which have, from time to time, been performed on the lower animals, and especially recorded by Mr. Travers, and more recently by Dr. Gross, of Philadelphia. For the conditions suppose the escape of some portion of the intestinal contents, whereby acute peritonitis is established; and from this cause, as in similar lesions otherwise produced, fatal collapse follows. I have already remarked on the circumstances which favour recovery without serious consequences, after wound of the peritoneum; and I shall have occasion to revert to this subject before I conclude.

Further, we know that the stomach or the colon may be opened, or the bowel may be accidentally wounded in operating for hernia—for such cases have occurred—without serious effects, *quoad* the wound, provided regard be had to the security of the peritoneum from the ingress of foreign matter; therefore we may fairly conclude that such visceral lesion is not, in itself, destructive; on the contrary, we know that, under favouring circumstances, it is capable of repair. On the other hand, in a penetrating wound of the bowel, a necessary preliminary to a cure is, such a closure of the aperture by protrusion and eversion of the mucous membrane as shall, the parts being left at rest, be a security against the extravasation of its contents. These conditions are, unfortunately, rarely fulfilled, and hence the usual fatality of such injuries.

Therefore, the general symptoms and local signs of incised or punctured intestine—apart, that is, from demonstrative evidence by sight or touch—do not differ from those of ruptured bowel. The nature of the former class of lesions is such as to hold out a better prospect of recovery, small though it be, than the latter; but this advantage is chiefly due to the possibly limited extent of the breach rather than to any other circumstance. In both, the escape of the intestinal contents into the peritoneum is the chief source of danger, and the explanation of the fatality which attends these cases.

There is every reason to believe, as I remarked in my last lecture, that lesions by rupture of the solid viscera are not infrequently repaired, the obvious explanation of the relative immunity from peritonitis in such cases being, the absence of that source of irritation which is supplied from the membranous viscera. Laceration of the texture of the liver, and even of the kidney, does not usually include the tubular or membranous portions of these organs, so that the escape or extravasation of their special secretion into the peritoneal cavity is exceptional. Moreover, the presence of bile, even in abundance, if a conclusion may be drawn from the solitary case which I narrated just now, does not seem to entail the amount of mischief which might have been anticipated from its acrid properties. The presence even of urine in the pelvic peritoneum does not, in many instances, produce the rapidly fatal consequences which its escape into other tissues would, by analogy, lead us to expect. The speedy coating of any such textural lesion with plastic lymph arrests the tendency to extravasation in the solid viscera,

and limits the consequent inflammation to the seat of injury. The displacement of this important element of repair, by some accidental or incautious movement, would appear to offer satisfactory explanation of those symptoms of relapse which I have not infrequently noticed, and on which I have already commented.

Probably the repair of these lesions of the solid viscera is, under favouring circumstances, rapidly accomplished, as we should anticipate in parts so highly organised. In one instance, in which I saw the liver wounded on its surface to some extent, there was no trace of the injury a week afterwards, when the patient died. Incised or punctured wounds of the liver, if of any depth, are likely to be attended by considerable hæmorrhage; and this may be external, as occurred in a patient of mine who, in a fit of delirium, inflicted several wounds upon himself with a butcher's knife. He had bled profusely, and was cold and exsanguine when admitted into the hospital. A distinct fissure made by the knife in the liver could be felt. His symptoms included occasional spasm of the muscles of the back and abdomen, with eructation and nausea: the respiration was quick, feeble and shallow. The oozing of blood continued until his death, which occurred in less than twenty-four hours. One hour before death his temperature sank to 93 deg.—an unusually low degree. The pleuræ and pericardium contained blood-stained serum, but were uninjured: the peritoneum contained fluid blood. Both omentum and liver were penetrated by the knife. Hæmorrhage, occurring in a maniacal subject, was the cause of death in this instance; for no other organ was injured, and there was no trace of reparative effort visible. I may remark, in referring to this case, that it rarely occurs that we are able, before death, to identify a lesion of this description. In an earlier lecture I related an instance in which recovery took place, where there was good reason for believing that both the liver and lung were involved in a similar injury. The following case exemplifies the condition usually observed in penetrating wound of the abdomen, implicating the intestine.

B. G., aged 44, was admitted under my care, shortly after he had been stabbed in the abdomen with a knife. He was in a state of profound collapse, with cold surface and depressed temperature, and that peculiarly anxious expression of face which accompanies, though it can scarcely be said to specially denote, a mortal injury. The wound was two inches long, and just below and to the left of the umbilicus, and through it portions of the small intestine, colon, and omentum, protruded. He had several attacks of shivering and vomiting, with frequent eructation, and severe twitching of the muscles. A small wound of the intestine was closed with a silk suture, and the bowels were returned. He survived twenty-six hours, without signs of reaction. At the *post mortem* examination, the intestines on the left side were found somewhat glued together, and a few flakes of lymph were found between their coils elsewhere. There was some turbid reddish fluid in the pelvis, but no trace of fecal matter could be detected. A piece of the ileum was glued by recent lymph to a pouch between the transversalis and internal oblique muscles, opposite to the wound. Close to its mesenteric attachment was the part of the bowel which had been wounded. The opening was half-an-inch long; but its edges were so perfectly united, that no leakage occurred when the gut was distended with water. The early agglutination and consequent closure of the wound in the intestine is an interesting and encouraging circumstance: this case further exemplifies a remark which I made in my last lecture, and which I have repeatedly verified, that the reparative effort occurs very early, and often without those symptoms which denote reaction and acute peritonitis.

In a more extensive injury of the jejunum under my care, where the patient also survived about twenty-four hours, there was gas as well as fetid fluid in the peritoneum, and the intestines were rough with lymph. But in the case of a pregnant woman who was the subject of a lacerated wound near to the duodenum, and who survived only nine hours, there was no evidence of hypervascular action in the peritoneum. I infer, therefore, from these and very many similar cases which I have examined, that the reparative process, as evinced by local hyperæmia and the deposit of plastic material, may be initiated and proceed satisfactorily, without any general reaction following the mortal wound; and that unmistakable tokens of this effort are manifested after the lapse of from twelve to twenty-four hours.

In these instances of penetrating wounds of the abdomen, the most satisfactory condition is indicated by the absence of symptoms which evince excess of local action accompanied with general prostration; and this is more likely to be secured by absolute rest than by any other means. The following case, though ultimately fatal, illustrates this remark, as well as the obscurity involving the diagnosis, from symptoms, in these injuries.

H. T., aged 19, was admitted into St. Thomas's Hospital with a wound from a small pistol-bullet, which entered the abdomen one inch

below and to the left of the umbilicus. The pistol was fired from the bottom of a flight of stairs, at the top of which he was standing. There was but little shock. The treatment consisted in giving opium internally, applying ice to the abdomen, and keeping him on a spare liquid diet. At the close of a week, during which interval he had remained perfectly at rest, and was almost entirely free from febrile disturbance, he felt so well that he got out of bed to pass urine. Immediately afterwards, symptoms of extravasation into the peritoneum came on rapidly; and he died within twenty-four hours. At the autopsy, a small cicatrix marked the spot at which the bullet had entered. A quantity of gas escaped from the distended peritoneum, which contained also recent lymph, pus, and turbid fluid. The omentum and abdominal wall were adherent together; faecal matter escaped when this adhesion was separated, the intestines being glued to the omentum. The small intestine was perforated in six places; and there were two apertures in the sigmoid flexure of the colon; from one of the former the faecal matter had chiefly escaped. There was no lesion in the posterior wall of the abdomen or the pelvis; but the bullet was not found.

In the succeeding case there is a reasonable probability that the bowel was wounded, or at any rate contused, though the patient's recovery did not permit the verification of this conjecture.

A groom, thirty years of age, of moderate development, was admitted into St. Thomas's Hospital with a penetrating wound of the abdomen, which had been pierced horizontally and transversely, from right to left, with the prong of a stable-fork. There were two wounds, about five inches apart and two inches below the umbilicus, of which the right was the larger. Very little blood had been lost, and he was in a state of collapse. He was kept under the influence of opium for a week, the wounds discharging very little; the tenderness was almost entirely confined to the neighbourhood of the wound. At the expiration of ten days an abscess formed between the wounds, from which faecal matter subsequently escaped. The discharge continued for three or four weeks, when the openings finally closed, and he entirely recovered. It is certainly possible that in this instance, as the patient had not a prominent abdomen, the intestine may have escaped injury. There was not even demonstrative proof, though very little doubt, that the peritoneum was perforated, as there was no indulgence in the pernicious practice of probing the wound. But it is quite possible that the blunt point of a pitch-fork may have pierced the serous membrane and pushed the bowel before it out of the way. Of the subsequent adhesion of the intestine to the peritoneal wall in front, and of its communication with the abscess, there was positive evidence; yet this result does not prove that the bowel was implicated in the original injury, though I think it probable that such was the case.

Before quitting the subject of abdominal lesions, I am tempted to mention a remarkable instance of the development of an enormous cyst succeeding an injury.

In October last, I was requested by Mr. Stedman, of Guildford, to visit a patient at the Surrey County Hospital, to which I have the honour of being consulting-surgeon. The following is a condensed history of the case before I saw the patient. H. F., a coachman, aged 25, was kicked by a horse midway between the ensiform cartilage and umbilicus. The injury paralysed the diaphragm for some seconds, but did not render him insensible. His suffering being great, he had an anodyne draught at night, which he rejected; this was the only occasion on which he was sick. At the expiration of two weeks, the pain continuing, he perceived a tumour in the epigastric region, after which the suffering increased, especially in movement; but he had neither sickness nor rigor. He then came to the hospital, pale and feeble; and lay curled up in bed, or resting on his hands and knees to obtain relief. A tense, elastic tumour, dull and fluctuating, occupied the epigastric region; it was tender, and descended with inspiration; the skin was not discoloured. A grooved needle was introduced, and a few drops of sero-sanguineous fluid escaped. The swelling steadily increased, and a fortnight later was tapped, five pints of claret-coloured albuminous fluid being drawn off. The sac speedily refilled, and ten days later four pints of fluid of the same character were removed. He suffered from dyspepsia, but had no sickness. After the lapse of another month, this cavity was again tapped, with the same result as before. This was repeated on three succeeding occasions, and an ineffectual effort was made to keep the opening patent. Six months from the date of his admission I saw him. There was then a hemispherical swelling extending, in a vertical direction, from the ensiform cartilage which was pushed forwards, to near the umbilicus, and laterally was lost beneath the ribs of either side. It was slightly conical in the centre, dense and resisting, but fluctuating. In the sitting posture, the intercostal spaces below the seventh ribs were bulging, especially on the left side, to which the swelling somewhat inclined. The ribs were widely expanded, giving abnormal breadth to the lower part of the chest by their divergence. On

tapping with the finger the lower intercostal spaces, a distinct wave was felt across on the opposite side of the chest, below the seventh rib. The breath-sounds were distinctly audible above this line; but not below, where there was complete dulness on percussion, except high in the left hypochondrium, which was abnormally resonant, from the presence of the displaced and distended stomach. The heart was pushed upwards, its apex beating between the third and fourth ribs. There was no dyspnoea, but imperfect oxygenation of the blood, as evinced by the pallor and slightly livid hue of the complexion. I made an incision, about an inch long, in the median line, over the summit of the tumour, dividing in succession the rectus and the posterior layer of its sheath. I could discover no separation between the peritoneum and the sac, which was then opened, and at least twelve pints of serum were allowed to escape. I then introduced my finger, and swept it over the interior of the sac; and, so far as I could reach, I could discover no communication with any serous cavity. The sac extended across the epigastrium, was adherent to the diaphragm above, and stretched deeply into both hypochondriac regions, displacing all the surrounding viscera, none of which could be felt, except the heart pulsating against the phrenic wall, and the aorta indistinctly beating behind. The interior of the collapsed sac felt like that of the urinary bladder—soft, uneven, corrugated, and thrown into folds. The ribs had fallen, and the complexion was improved by the more free expansion of the lungs after the operation. A small quantity of iodine was injected, and the opening was retained by the introduction of a piece of lint. It is unnecessary to relate the subsequent details of this case. I received, from time to time, an account of the patient, who gradually rallied from the slight constitutional disturbance and local inflammation following the operation. The opening was never allowed to close; and, according to the last account received after he had left the hospital, and, three months subsequently to my seeing him, he was looking healthy and growing stout. There was still a trifling discharge; but no appearance of tumour remained, a little thickening alone marking its original site. The respiration could be heard quite to the base of the lungs on both sides, behind. In front, the liver appeared to be permanently displaced, so as to encroach on the right lung; and the left lung could not be heard lower than the apex of the heart, in consequence of the stomach still retaining its former position. All the assimilative functions were healthily performed, and the patient was quite free from pain.

The possibility of our having, in this instance, to deal with a large hydatid cyst naturally suggested itself; but the character of the fluid contents, and especially its microscopic examination, forbade this conclusion. Moreover, the direct association of the tumour with the accident seemed to point to a traumatic origin. The examination of the interior of the sac proved that it was developed in the abdominal serous membrane; but in what way and under what circumstances must be matter of conjecture.

I have spoken of fluctuation as an important element in the diagnosis of abdominal tumours. But I may remark that this sign, in its most unequivocal form, is not diagnostic of the actual nature and quality of their contents. The slightest impulse will convey as perfect a wave across an ovarian cyst containing thick gelatinous matter, as in one containing limpid fluid. Even the subdivision of the tumour into many cysts does not interfere, in any appreciable degree, with the presence of this sign. In a case in which I recently performed ovariectomy, the mass of the tumour consisted of numberless endogenous cysts, the contents of which were various, some being occupied by puriform matter, others by colloid, and again, others by limpid or thick and grumous fluid; yet the wave across the distended belly could be elicited in any direction by the gentlest tap. I may also remark, in reference to this particular case, as, indeed, in others with which I have dealt, that the previous history did not induce me to expect the universal adhesions which I found; so insidious and unmarked is that form of vascular action which leads to this result.

In comparing the consequences of mechanical injury to the viscera of the chest and abdomen, and to their serous envelopes, the points of contrast are more striking than those of similarity. It is true that inflammation of the serous membranes exhibits, in its results, the same tendencies, whether in the head, chest, or abdomen; but these results operate very differently in the several regions. Even the milder forms of effusion in the pericardium and pleura are serious, from the mechanical impediment which they offer to the functional activity of the organs they envelope; whereas, the peritoneum may be enormously distended without the contained viscera suffering importantly from the pressure thereby exercised upon them. The difference in question is, of course, due to the contrast in the yielding character of the walls of the two cavities; and this feature, as I have already remarked, operates still more potentially in the cranium, where the pressure tells exclusively upon the deli-

cate texture of the organ within. What is true of the milder forms of inflammatory products, is not less so of the consequences of acute inflammation; but there are also other elements of considerable importance here introduced. In the chest, the tendency to complication, in the inflammatory action, of the lung-structure and pleura, is greater than in corresponding inflammation in the abdomen; and the peritoneum is more susceptible to the presence of its own morbid products than is the pleura; a circumstance apparently referable to the same cause as that to which the relative susceptibility to shock of these membranes, severally, is attributable.

In contrasting the effects of injury to the organs themselves contained in these two cavities, such comparison can be instituted only between the solid viscera of the abdomen and the lungs; as there is no analogy between the anatomical relations of the trachea with its bronchial ramifications, and the membranous viscera of the abdomen. Hæmorrhage is the most frequent cause of fatality in wounds of the lungs, liver, spleen, and, perhaps, of the kidney; but such bleeding always kills by exhaustion when derived from the latter organs; whereas, it may be destructive by suffocation when occurring in the former, either by obstructing the air-passages, or by accumulation in the pleura, and compression of the lung-tissue from without. The diagnosis is, therefore, more simple, from the physical signs present, in thoracic than in abdominal hæmorrhage.

The effects of shock, from contusion or concussion, on the lungs and abdominal viscera are manifested through the same system of nerves, but in a different way. Vascular congestion, the consequence of suspended function in the vaso-motor nerves, characterises the former; paralysis of the muscular coat of the bowels, and disturbance in the functions of the excretory organs is witnessed in the latter; and the duration of these symptoms is generally proportioned to their intensity.

The means by which nature cures these lesions are similar in the lungs and in the solid viscera of the abdomen; and in each, as a rule, the consequences of structural injury are limited, ultimately, to the neighbourhood of the breach. That the arrangements existing for the security of the various vital organs against injury are not perfect, is due to their mechanical requirements in the healthy performance of their functions, and to the necessary structure of their containing cavities in relation to these offices. For, neither in organic mechanism, nor in pathological processes or results, are we to expect incompatibilities, or to look for special provisions for every emergency. But we find the adaptation of the existing material and means to varied circumstances as perfect as the perplexing influence of disturbing elements will permit. And if the curative results are not always commensurate with our expectation or desire, it is because we do not give their full weight to the character and violence of the injury inflicted, nor attach due importance to the various predisposing and existing causes, which tend to mar the natural remedial efforts. Perhaps we may, without an excess of humility, confess that, from the imperfection of our science and art, our own endeavours to render assistance have fallen short of our good intentions; and it is not surprising if honesty sometimes compel us to admit that a better acquaintance with the actual condition of our patient, and a more judicious reading of nature's indications, would have saved us from the mortification of learning, when too late, how to render that timely assistance which might have been successful in protracting or preserving life.

ON A FATAL CASE OF GENERAL EMPHYSEMA PRODUCED BY VIOLENT SCREAMING.*

By T. R. JESSOP, Esq., F.R.C.S.,

Lecturer on Anatomy and Physiology in the Leeds School of Medicine.

GENERAL emphysema, produced otherwise than by accident from without, is an occurrence of sufficient rarity, for me to feel that no apology is needed in occupying this Section for a few minutes, whilst I relate the leading particulars of a case which has lately come before me in my practice.

The subject was a schoolboy, 8 years old, who resided in New Wortley, a suburb of Leeds. During the second week in December 1868, he daily joined his playmates in a game which required the participants in it to kick a stone as often and as violently as they could. On the night of the 15th of December, the lad complained of pain in the left ankle-joint, and, on examining the part, his mother found it red and swollen. On the 19th, I was requested to visit him, and I then found that the joint had become the seat of acute synovitis. There was a high condition of inflammatory fever, and the stomach rejected every

thing he swallowed. Leeches to the joint, followed by an evaporating lotion, a saline aperient, and a complete restriction of the food to small and oft repeated sips of brandy and milk, resulted, on the following day, the 20th of December, in a decided relief of his symptoms. On the 21st, he seemed exceedingly fretful, and complained almost constantly of pain in the right abdomen, and in the head; and, towards evening, he cried out of pain in the left chest. A mustard cataplasm on the chest, and a powder containing two grains of Dover's powder and four of mercury with chalk, procured him a favourable night. Early on the morning of the 22nd, however, he began to scream most violently, and without ceasing. He absolutely refused to be comforted for a moment even, or to give us any clue as to the site of his pain. All that day and the succeeding night he continued his screaming with no intermission. At about 6 o'clock on the morning of the 23rd, his mother noticed a little puffiness on the left side of his neck, and soon she became alarmed at the rapid progress made by the swelling. By 10 A.M., on my arrival, the head, face, neck, chest, and abdomen had become enormously distended; air could be distinctly felt in the cellular tissue all over the trunk, and down the arms as far as the wrists; none could be detected in the legs or thighs, or, indeed, below the groin on either side. He continued screaming, though less violently than on the day before. The treatment I adopted consisted of puncturing the skin in many places, and the administration of brandy. His breathing never became much embarrassed, but the circulation, and his powers generally, became gradually feebler, and at 2 P.M., eight hours after the first appearance of the emphysema, he died.

Twenty-six hours after death I made an examination of the chest, the friends stipulating that the head and ankle should be left untouched. The head, neck, and trunk remained largely distended; and the characteristic crackling could be felt as far down as the wrists in both arms. The ankle had acquired an almost natural appearance, being but little larger than the right joint. On making the incision necessary for opening the chest and abdomen, a large quantity of most offensive air escaped, and the muscles of the abdomen alone were observed to be completely blackened. In the abdomen, the organs were in a perfectly healthy and normal condition, and I was unable to find anything to account for the pain of which he had complained on the 21st. On opening the chest, the mediastina were found to contain air; but, although they were somewhat distended, I could not satisfy myself that the lungs had been greatly impeded in consequence; and this circumstance would probably account for the length of time, considering the extent and degree of emphysema, during which he lingered. Air had also penetrated in small quantity the costal subpleural tissue.

The heart and its coverings were healthy, the right cavities containing dark blood.

The lungs appeared of normal size; their inferior borders and their apices were the seats of slight vesicular emphysema. I was unable to detect any extravasated air beneath the pulmonary pleuræ, except at the roots of the lungs; but, on a close inspection of the outer surface of the right lung, a very thin film of recent lymph was observed, and at irregular intervals I noticed very small immoveable elevations, the largest of which was about the size of a pin's head. On cutting into these, they were found to be small irregular cavities containing air and a little red coloured serum. I counted eight of them, all on the front external surface of the lower lobe of the right lung, and I was unable to find any elsewhere. On microscopic examination, the lung-tissue, which shewed no signs of degeneration, was found torn at these places.

The points which I think worthy of notice in this case are:—

1. The cause of the rupture in the lung: the violent and long continued compression, viz., to which the lung was subjected, in the production of a series of loud shrill notes. The glottis would necessarily be nearly closed, thus offering a great impediment to the exit of the air, whilst the expiratory efforts were the greatest of which the lad was capable.
2. The age of the patient—8 years. Dr. Mapother of Dublin, remarking on a case of general emphysema, in a child, two years old, published by him in the *Medical Press and Circular* of April 29th, 1868, says: "Out of thirty-eight such recorded cases which I have analysed, thirty-four were in children under four years."
3. The great number of points at which the lung-tissue had become ruptured, eight of them at least, be it remarked, having been found upon the surface, immediately beneath the pleuræ; whilst the most usual situation is undoubtedly near the root.
4. The comparatively small quantity of air found in the mediastina.
5. The probable immediate cause of death, which, I think, is to be found rather in the occurrence of a succession of injuries to a vital organ, than in the interference with respiration by pressure upon the lungs of extravasated air.

* Read in the Surgical Section at the Annual Meeting of the British Medical Association in Leeds, July 1869.