

and mixed with air, while similar blood is expectorated; especially if the blood-flow varies with respiration, and is attended with traumatopncea or extensive emphysema, it may be regarded as coming from the *lung*. Extensive hæmorrhage from a wound over the area occupied by the heart and great vessels from a wound of those structures is attended with hæmorrhage into the pericardium or mediastinum, and is quickly fatal. The position and direction of the wound may enable the distinction to be made between wound of the heart and wound of one of the great vessels. It must be added that the diagnosis between parietal and visceral hæmorrhages may be impossible without exploration of the wound, and also that they may coexist.

(3) **Does the wound implicate a viscus?—**

This is the most important question in reference to wounds of the chest, as upon the correct answer to it the prognosis mainly depends.

(a) If a wound of the chest be attended with moderate emphysema, or slight traumatopncea or pneumothorax and collapse of lung, and there be no evidence of external hæmorrhage more than that accounted for by the external wound, and no hæmorthorax, and no hæmoptysis, the diagnosis of *wound of the pleura* without injury of the lung is to be made; this lesion is rare, and is met with towards the extreme base of the lung, and as a result of wounds by not very sharp instruments.

(b) If instantly or quickly following a wound of the chest, a soft, smooth, dark purple mass be found projecting from the wound, elastic and crepitant to the fingers, it is a *hernia of the lung* due to a *wound of the pleura*. This is met with especially in wounds of the front of the chest, near the fissures of the lungs. The appearance and feel of the lung are characteristic, but a protrusion of very congested omentum has been

mistaken for the lung, a mistake which may be avoided by noticing the lobulated condition of the omentum, and the smoothness and crepitation of the lung.

(c) Where there is extensive emphysema complicating a wound, or marked pneumothorax, hæmorthorax, free hæmoptysis, or distinct traumatopncea, and especially where two or more of these are met with together, a *wound of lung* is to be diagnosed.

(d) If a wound over the region of the heart be followed by tympanitic resonance over the cardiac area, with (sometimes without) a loud ringing character of the heart sounds, and if after a short interval there be dulness over more or less of the lower part of the cardiac area, with a tympanitic note above, a raised position of the heart's impulse, dyspncea, distress, epigastric pain and quickened feeble pulse, followed in a few hours by pericardial friction, the evidence warrants the diagnosis of *wound of the pericardium*, leading to *pneumopericardium*, *hæmopericardium* and *pericarditis*.

(e) If a wound over the heart be immediately followed by considerable shock and syncope, with free external bleeding, or evidence of internal bleeding into the mediastinum or pericardium, with rapid weak pulse, and be quickly followed by the usual signs of pericarditis, a diagnosis of *wound of the heart* should be made. Should a foreign body be found in the wound, such as a long needle, and it be noticed to move with every pulsation of the heart, it may be assumed that it is embedded in the heart wall. There is often considerable anxiety and fear in cases of wound of the heart; they may be extremely difficult to diagnose, and some reliance must be placed upon the nature of the injury, the hæmorrhage and the early onset of pericarditis. The position of the wound will enable the surgeon to determine approximately which part of the heart is wounded.

(f) A wound over the great thoracic blood vessels, followed by profuse hæmorrhage and all the signs of extensive *hæmomediastinum*, with collapse, syncope, and dyspnoea, is complicated with *wound of a great blood-vessel*; such injuries are with few exceptions certainly fatal in a few hours.

(g) If after a wound of the chest there be spitting of blood, dysphagia, and liquids swallowed are found to escape at the external wound, a *wound of the œsophagus* (a rare accident) is to be diagnosed.

(h) Where, after a wound in the chest, there is a flow of clear serous fluid which becomes milky in appearance after a full meal, and the fluid on examination is found to consist of a very fine molecular base with globular nucleated corpuscles, and to contain much fat, a *wound of the thoracic duct* is to be recognised. This injury is very rare, and if the fistula continues open it leads to considerable emaciation and exhaustion.

(4) Is there a foreign body in the wound?

—In some cases it is extremely easy to answer this question, but in many others it is quite impossible. A knowledge of the mode of infliction of the wound, whether by gunshot, stab, or prick, is important, and an examination of the clothes should always be made. In cases of stab wounds, the weapon used should be carefully examined for any evidence of recent fracture. In cases of bullet wounds, an inspection of the pistol may show how many bullets have been discharged, and they should then be sought for where the shots were fired, and in the patient's clothes. By these facts it may be shown to be extremely improbable that any foreign body is lodged in the wound, or, on the contrary, practically certain that such is the case.

The next step will be to examine the wound. A knife-blade may be found transfixing a rib, or the end of a needle projecting through or under the skin, or a

finger or a probe may detect a bullet in the wound, or the detachment of the part of a rib. Where there is a history clearly pointing to the lodgment of a foreign body, the onset of acute inflammation of the wounded part running on to suppuration confirms the suspicion. In some instances, when the collection of pus (empyema or pulmonary abscess) has been evacuated the foreign body has been discharged with the pus, or detected on an examination of the cavity with the probe, and removed. In the case of a needle or knife-blade or similar body transfixing the præcordial region, if a movement is communicated to it by the contraction of the heart it shows that it is *impacted in the heart*. Where the history indicates the lodgment of a foreign body in the pulmonary region of the chest, and there are no indications of a wound of the lung, and acute pleurisy and empyema ensues, it points to the presence of the foreign body in the *sac of the pleura*. Where, on the other hand, the signs are those of wound of the lung, and especially if pneumonia and a pulmonary abscess suddenly bursting into a bronchus occur, it points to the lodgment of the body *in the lung*. A certain diagnosis is not always possible.

C. The secondary complications of injuries of the chest.—The sequelæ of injuries of the chest are, with one exception, inflammations of the various structures involved, which frequently terminate in suppuration. It may be useful to append a list of them:

- | | |
|----------------------------|---------------------------|
| (a) Muscular rheumatism, | (g) Gangrene of the lung, |
| (b) Subpectoral abscess, | (h) Mediastinal abscess, |
| (c) Peripleuritic abscess, | (i) Pericarditis, |
| (d) Pleurisy, | (k) Myocarditis, |
| (e) Empyema, | (l) Endocarditis, |
| (f) Pneumonia, | (m) Pneumocele. |

If the patient convalesce without pyrexia, pain, dyspnoea, syncope, palpitation, or other sign of

respiratory or circulatory difficulty, it indicates an absence of these complications. But the accession of pain, or especially of fever, with or without an initial rigor, of increased dyspnoea, or of signs of cardiac failure should at once excite suspicion, leading to a careful examination of the chest, while a knowledge of the nature of the original injury will suggest the inflammatory lesions to be especially anticipated. Thus simple fracture of the rib is not unfrequently followed by pleurisy, with or without effusion; wound of the pleura and hæmothorax often runs on to empyema, wound of the lung to pneumonia, and a bruise may lead to muscular rheumatism. First examine the chest walls for any evidence of "rheumatism" or of swelling, and then make a systematic physical examination of the lungs and heart.

(a) If after a contusion of the chest, or some sudden strain, the patient continue to suffer from a localised pain on taking a deep breath, or on coughing, or on attempting to contract any of the thoracic muscles, and if the painful part be also tender, with no evidence of a fracture of a rib (*see* page 142), or of pleurisy (*see* page 129), or other intrathoracic complication, *i.e.* if there be no friction and no dulness on percussion, *muscular rheumatism*, intercostal or other, must be diagnosed.

(b) When with the general signs of inflammation the front of the chest is found swollen, the swelling being ill-defined, boggy, and œdematous in nature, attended with considerable pain and tenderness and great pain on raising the arm forwards; and further when it is known that this swelling did not immediately follow the injury; a *subpectoral abscess* is to be diagnosed. In these cases the pus is often too deep to give rise to fluctuation; where there is doubt an exploring needle or trocar may be introduced: fluctuation will be earliest detected in the axilla.

(c) If, after a contusion or small punctured wound of the chest which has healed, the patient become ill, feverish with high temperature, perhaps a rigor or rigors, with pain in the side, the site of the injury should be carefully examined. If, now, that part of the chest be found enlarged, with one or more intercostal spaces widened and bulging, while the ribs above are even closer together than normal; and if fluctuation can be detected in these bulging spaces, and if they are noticed to become less prominent during inspiration and more tense and full during expiration; if this area be dull on percussion and vocal fremitus be abolished over it, and the respiratory murmur be weak, but there be no friction heard; and, further, if the heart be not displaced to the opposite side, or the liver or other abdominal organs depressed, *peripleuritic abscess* should be diagnosed; if on tapping the swelling pus flow out from the part more forcibly and rapidly during expiration, this diagnosis will be confirmed. Bartels asserts that the pus from such an abscess is of a higher specific gravity than that from empyema, the latter not being above 1032, while the former, in one case observed by him, was as high as 1041. In such a case the diagnosis lies between empyema and peripleuritic abscess, and the attention must be directed especially to the following points. In empyema, the distension of the chest is uniform, and "pointing" is a late sign; while in peripleuritic abscess the distension is more localised, and "pointing" is noticed earlier. In empyema, the dull area nearly always involves the lowest part of the pleural sac, even if it rises high up, and its upper level may be modified by position. In abscess there may be a resonant area below the dull area in which the respiratory movements and sounds are normal, and the level of dulness is quite unaffected by position. In empyema there is displacement of the neighbour-

ing organs, in abscess there is not; in empyema a difference in tension of the swelling during inspiration and expiration is not observed, and on tapping the collection of pus, the flow is not at first affected by respiration, but only later on. Peripleuritic abscess is a very rare affection; it may arise spontaneously as well as from injury; it may burst into the pleura and set up purulent pleurisy, or spread to the mediastinum and pericardium, involving those tissues in supuration.

(d) If, on ausculting the chest, a dry rubbing or creaking sound be heard with inspiration and expiration, limited to a certain area of the chest, and unattended with dulness on percussion, it indicates *dry pleurisy*. Such friction may be heard just above a pleuritic effusion or over a pneumonic lung.

(e) If one side of the chest be found enlarged, with bulging of the intercostal spaces, and great lessening of the respiratory movements, and is dull on percussion, with loss of vocal fremitus, while the breath-sounds are inaudible, or are distant, weak, and bronchial in character, and the vocal resonance is distant and bronchophonic; and if, further, there be displacement of the heart to the opposite side, and if on the right side, of the liver downwards with exaggerated breathing in the opposite lung, there can be no doubt that there is an accumulation in the pleural sac. These signs, found quickly after the injury, point to *hæmothorax*; coming on after an interval of a day or two, or increasing at that time, and especially when attended with fever and increasing dyspnoea, they clearly indicate *pleurisy with effusion*, while if the temperature continue to rise and remain very high, or if there are rigors with sweatings, and emaciation; or if a localised fluctuating swelling form in any part of the chest wall, *empyema* is to be diagnosed. Wherever any doubt as to the nature of the fluid in the chest is

entertained, a small exploring syringe should be introduced and a portion of the fluid withdrawn for examination. This method of diagnosis, the most certain of all, is justly coming more and more into use.

(f) If the examination of the chest show localised dulness around the wound, with tubular breathing, fine crepitation, and bronchophony, and the patient be febrile, with sharp pain in the chest, cough, and rusty expectoration, *traumatic pneumonia* is to be diagnosed. This form is less severe and less extensive than the idiopathic. If combined with pleurisy, the physical signs will be modified, and reliance in the diagnosis of *pleuro-pneumonia* will be placed especially on the combination of rusty expectoration, tubular breathing, and fine crepitation with loss of vocal fremitus, bulging of intercostal spaces and perhaps friction. Should the inflammation attack a portion of lung that has been wounded, coarse, moist râles may be heard. If, in a case of pneumonia, the patient suddenly cough up a quantity of pus, it will point to an *abscess* in the lung, which has burst into a bronchus; and if now the signs of a cavity are present where before there was evidence of pulmonary consolidation, this diagnosis and the exact position of the abscess will be established.

(g) If, with or without evidence of traumatic pneumonia, the patient, some days after the injury, cough up dark and extremely fetid sputa, and the breath have a horribly fetid odour, the diagnosis of *gangrene of the lung* is to be made. This may be confirmed by detecting shreds of pulmonary tissue in the expectoration, the elastic fibres having a characteristic clear defined outline under the microscope, and resisting the action of acetic acid. An attempt should be made to localise the gangrene for the purpose of treatment; and if an area of dulness,

with moist râles and hollow respiratory murmur be detected, that may be regarded as the seat of the disease. Gangrene is a rare sequel to chest injuries, but is met with occasionally after contusions and wounds, particularly if the lung is much lacerated or a foreign body is retained.

(h) If in a case of *pneumo- or hæmo-mediastinum*, or of severe blow or wound of the sternum, the distress of the patient become considerably increased, and there be palpitation of the heart, and dyspnoea, or œdema and signs of venous obstruction in the head, neck, and upper limbs, and on percussion a dull area is found over the sternum and extending laterally over the costal cartilages, and if with this there be pyrexia, with, perhaps, rigors, the surgeon must suspect *mediastinal abscess*. Careful examination of the suprasternal notch of the intercostal spaces close to the sternum and of the epigastrium should then be frequently made, and if at either of these situations a soft fluctuating swelling appear, which may have a pulsation transmitted from the heart, or become fuller and more tense during expiration, this diagnosis will be established. The diagnosis will probably not be made before the abscess "points;" but when it is suspected, an exploring syringe should be carefully introduced. The abscess may suddenly burst into either the pleura or the pericardium, setting up acute inflammation. Death often takes place before pointing has occurred.

(i) Even within a few hours after a wound of the pericardium, friction may be heard over the cardiac area, showing the development of *pericarditis*. Pericardial friction is to be distinguished from pleuritic friction by the place where it is heard, by its being unmodified by respiration, and accompanying both sounds of the heart; and from endocardial murmurs, by its creaking or rubbing character, its uniformity with both sounds of the heart, its strict limitation, its

want of conduction along the vessels or round into the axilla, and in some cases by its modification by firm pressure with the stethoscope. If this be followed by an increase in the area of cardiac dulness which takes the shape of the pericardium, with displacement upwards and to the left of the heart's impulse (which may be quite lost) increased frequency of the heart's action and loss of the heart sounds over much of the dull area, while the pulse is small and weak, and dyspnoea very marked, the patient sitting up in bed and leaning forward, and having a frequent dry short cough, *pericardial effusion* has occurred. Should rigors occur, and there be any tendency to "point" in any part of the dull area, *pyopericardium* may be diagnosed; an exploring syringe will at once determine the nature of the fluid in the sac.

(k) When, in connection with pericarditis, the heart's action becomes extremely weak and irregular, leading to syncope on movement or sitting upright, the existence of *myocarditis* is to be inferred. There are no positive signs by which its presence may be demonstrated.

(l) If the surgeon be able to recognise the development of an endocardial murmur after a contusion, strain or other injury of the chest, *i.e.* if he at his early examination find the heart sounds clear, and subsequently note a murmur, it is evidence of the occurrence of *endocarditis*. The time, place of greatest intensity, and the direction of conduction of the murmur will enable a precise diagnosis of the valvular affection to be made. For this, reference should be made to works on medicine.

(m) If, after a wound in the chest has healed, or after a severe contusion, a tumour slowly and gradually appear, which is circumscribed, smooth, soft, rounded, crepitant under pressure, resonant on light percussion, with an impulse on coughing, expanding with each

expiration and contracting during inspiration, it is a consecutive prolapse of the lung, or a *pneumocoele*. These tumours may appear rapidly and attain a large size; they may be more or less reducible, allowing the outline of the aperture through which the lung escapes to be felt.

CHAPTER XI.

THE DIAGNOSIS OF INJURIES OF THE ABDOMEN.

INJURIES of the abdomen, as of the head and chest, derive their chief interest from the importance, and usually great danger, of any lesion of the viscera contained within the cavity. Hence, the question which above all presses for an answer is, whether any given injury has merely bruised or wounded the parietes, or whether there is a visceral lesion as well; and if the latter, which of the several viscera has been damaged. While visceral lesions are generally the result of the more severe forms of violence, the surgeon must always remember that even by apparently trivial blows fatal visceral ruptures may be caused, while recovery may take place after more severe contusions. In arriving at a diagnosis of a case of abdominal injury, it is well to consider that the patient is the subject of a visceral lesion until the contrary can be proved, and to employ the method of exclusion; and further, when examining the patient, the utmost gentleness of manipulation must be employed, lest the surgeon's fingers or the patient's movements should convert an incomplete into a complete rupture, or induce a renewal of hæmorrhage that Nature has arrested.

Abdominal injuries are to be divided into *con-*

tusions and wounds, of which the former are much the more common in civil practice, and form an exceedingly serious and highly fatal class of cases. The *sequelæ* of each group will be considered separately.

Exact diagnosis may be impossible when the patient is first seen. The absence of all acute symptoms, or of symptoms distinctly pointing to a visceral lesion, is not enough to justify the surgeon in proclaiming the injury unimportant; but he should wait to see whether any severe symptoms, especially inflammatory symptoms, set in. For example, there may be nothing to indicate soon after the injury even such a severe lesion as a rupture of the intestines, but in a few hours the onset of acute peritonitis will reveal the gravity of the case. The same holds good in the case of wounds. It is only if the patient *continue* to be free from severe symptoms that a diagnosis of a simple superficial lesion can be made.

A. Contusions.—There may be no indications whatever on the exterior of the severity of internal lesions; but no case, however trivial it may appear, is to be dismissed without a careful consideration of all the circumstances, and without waiting to see whether serious symptoms do or do not quickly ensue. Some assistance in diagnosis is to be obtained by a precise knowledge of the injury inflicted, whether a fall or blow or crush, and of the exact spot struck, and of the condition of the abdominal viscera at the time, especially whether the stomach or bladder was full. Attention is to be particularly directed to the general condition of the patient, to any evidence of shock or collapse, or of internal hæmorrhage, and to local signs, pain, tenderness, vomiting, emphysema and hæmaturia. *Pain* is, of course, a symptom of all injuries; but when it is intense, and increases spontaneously, *i.e.* without any movement on the part of the patient, or is fixed in one spot, and