Donaldson (Frank)

A Study of Diaphragmatic Pleurisy.

BY

FRANK DONALDSON, JR., B. A., M. D.,

Chief of Clinic for Throat and Chest, University of Maryland, and late Scholar in Biology, Johns Hopkins University.

FROM

THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES.

APRIL, 1886.

Extracted from the
American Journal of the Medical Sciences for April, 1886.

A STUDY OF DIAPHRAGMATIC PLEURISY.

By Frank Donaldson, Jr., B.A., M.D.,

chief of clinic for throat and chest, university of maryland, and late scholar in biology, johns hopkins university.

A case of diaphragmatic pleurisy which came under the writer's observation, some months since, attracted his attention to this very rare disease, and forms the basis of this study.

Diaphragmatic pleurisy seems to have been known to the ancients in a general way. They describe it under many different names, as phrenitis, paraphrenitis, diaphragmitis, etc. Under these names they included several distinct affections, which had, however, the common symptoms, fever and delirium. Hippocrates[1] used the term phrenitis, but as designating a febrile state only, and not as indicating any disease of the diaphragm itself.

Oelguinetus and Tralian, however, seem to have known true phrenitis or inflammation of the diaphragm, for they speak of the distinct type of the respiratory movements in the latter affection—a type which they failed to notice in ordinary phrenitis, or delirium with fever.

The term paraphrenitis (first used by Rufus, of Ephesus,[2] a contemporary of Galen) had a more definite signification, and was applied by him to actual or supposed inflammation of the diaphragm where the brain was affected symptomatically. This author states that the partition which divided the organs of the chest from those of the abdomen was called *διαθραγμα* or *θρενες* (the soul), the ancients supposing the seat of the soul to be in the diaphragm, and he goes on to say, that as the term phrenitis was used to describe several distinct affections, he proposes that inflammation of the diaphragm should be designated as paraphrenitis, simply to prevent confusion. Galen[3] also knew diaphragmitis as a distinct affection, and in a chapter entitled "Phrenitis from inflammation of the brain, and that from inflammation of the *diaphragm*," describes the delirium which follows inflammation of the brain, of the lungs, and of the pleura, and remarks that inflammation of no other organ causes

[1] The Works of Hippocrates, by Francis Adams, Sydenham Society, 1849, vol. i. p. 418.
[2] Rufus, of Ephesus, De Corpor. Human., lib. i.
[3] De Locis affectis, lib. v. cap. v.

such continued delirium as that of the diaphragm. This writer, however, placed the seat of the inflammation in the *muscular* structure of this partition, and not in its serous covering, though he none the less accurately described the peculiar character of the respiration, and the retraction of the hypochondriac region, always present in this malady.

Wolffius[1] (1661) also recognized this disease as a distinct affection, and gives its symptoms in more or less detail. Following the last writer, Boerhaave[2] gives a complete description of diaphragmatic pleurisy, under the name paraphrenitis, recognizing it as an inflammation of the serous covering, viz.: "Si morbus pleuritidi similis occupat eam membranæ pleuræ partem quæ diaphragma ambit, vel et ipsum septum medium; paraphrenitidem appellant."

Huxam[3] goes further, and describes both primitive and secondary inflammation of the diaphragm. Morgagni[4] gives the case of a man who having escaped inflammation of the lungs, was taken with "a pleuro-peripneumony, which was succeeded by a phrenitis, and even by a paraphrenitis," and explains at length the exact sense in which the latter term is used by him, and declares that he does not wish to be understood as saying that the delirium (phrenitis) in this case necessarily depended on inflammation of the diaphragm. Sepulchretus[5] gives two observations of inflammation of the diaphragm, one from Blasius[6] and the other from Laelius à Fronté. The latter saw the diaphragm actually suppurated, and the former greatly inflamed after a phrenitis. Finally, Schneider[7] wrote quite fully on inflammatory affections of the diaphragm. With this author our history of the subject is brought down to the eighteenth century. During this hundred years our practical knowledge of diaphragmatic pleurisy cannot be said to have increased, though an enormous amount was written on the subject. I find, after careful search, some twenty-two distinct treatises of more or less scientific value written between 1700 and 1800, but I shall allude only to the more important of these monographs. Selle[8] seems to have been the first to use the term *diaphragmitis*, and, moreover, he gives the signs and symptoms of the disease with unusual clearness. Stoll[9] gives not only the general symptoms of the disease, but two cases thereof, observed by himself, with the post-mortem appearances. Lieutaud,[10] writing in 1767, gives three cases of diaphragmatic pleurisy, taken from De Haen,[11] and Cullen[12]

[1] De Septi Transversi Inflammatione; Argentorati, 1661.

[2] Aphor. de Cognos. et Curand. Morb., 1709.

[3] Essay of Fevers, 1747.

[4] De Sedibus et Causis Morborum. Translation of Dr. John Alexander, London, 1749, book I. letter vii. art 14, p. 139.

[5] Anat. Practica ex Cadav. Morbo denati. Edited by Theo. Boult, Geneva, 1679.

[6] Misc. Anatomica, etc, liber I. sec. i. obs. i, Amstelodami, 1673.

[7] De Inflam. Diaphragmatis, Wittenberg, 1665.

[8] Rudimenta Pyretologie, p. 170.

[9] Radio Medendi, 1777, p. 345.

[10] Historia Anat Medica, vol. i. p. 95.

[11] Radio Meden part I. p. 84, and part IX. p. 17.

[12] Elements of Practical Medicine, 1784.

directs particular attention to the disease, as involving not the muscle, but the pleura which covers it.

It was not, however, until the early part of the present century, after Bichat's researches, that inflammation of the serous coverings in general, and the diaphragmatic pleura in particular, attracted general attention to the part played by the latter in the causation of the disease before us. Portal[1] wrote that inflammation of the diaphragmatic pleura was by no means so rare a disease as was formerly supposed. Pierre Frank,[2] though he gives a number of the characteristic symptoms of this affection, confounds it with pleurisy proper and peritonitis. Roy,[3] in describing the risus sardonicus, declares it to be a constant symptom of inflammation of the diaphragmatic pleura. Laennec,[4] in the first edition of his work, describes inflammation of the diaphragm under the general head of circumscribed pleurisies. He declares the former to be a very rare and grave disease, but gives no definite diagnostic signs. Buffinton,[5] again, gives the symptoms of this disease, and says the malady is always fatal. This brings us to Andral,[9] who was the first to publish definite observations under the name of diaphragmatic pleurisy, and to show that the affection might be primary or secondary. He gives five cases in his *Clinique Médicale*,[7] and divides the symptoms into four groups, viz., 1st, the pain, increased by pressure, along the cartilaginous border of the false ribs, and extending down and outward; 2d, the almost complete immobility of the diaphragm; 3d, the expression of the countenance; and, 4th, the constant orthopnœa, with forward inclination of the body. To Andral must be given the credit of giving this disease, with its signs and symptoms, a definite place in medical literature. A number of authors after Andral wrote on this subject with more or less fulness and accuracy, Joseph Frank[8] more particularly giving much space to it. He adopted, however, the idea and nomenclature of the ancients, in spite of his acquaintance with Andral's advanced treatise. Mehliss[9] also wrote at some length on inflammatory affections of the diaphragm, but it remained for Gueneau de Mussy,[10] in 1853, to write the first elaborate monograph on diaphragmatic pleurisy, and the great importance of this work will be seen further on in our paper. I find a number of other articles on the subject, published from 1853 to the present date, reference to which will be found in the text.

So much for the history of our subject, and before treating it more in detail, I give briefly my own case, which I wish to put on record:

[1] Anatomie Médicale, 1803, vol. iv. p. 233.
[2] De Cur hominum Morbis Epitome, 1812, lib. ii. p. 179.
[3] Traité sur le rire, Paris, 1814.
[4] Traité de l'auscultation Médiate, Paris, 1819.
[5] Paris Thesis, 1822.
[6] Arch. de Médecine, October, 1823.
[7] Clinique Médicale, Paris, 1824, vol. i. p. 480.
[8] Pathologie Médicale, vol. iv. p. 371.
[9] Anat. du Diaphragm, chez l'homme, 1845.
[10] Archives de Médecine, 1853–54.

The patient, a man of about forty-one years, was brought to our office, in the words of his physician, "for a diagnosis." He had been sick for nine weeks; his illness had begun with a chill, followed by intense pain referred to the lower intercostal region, more particularly on the right side over the liver, with great and increasing difficulty of respiration. He had been, almost from the first, unable to lie down, sitting always with the body bent forward, and his hands pressed to his side to prevent any extra motion. His cough was incessant and dry, his dyspnœa and anxiety of countenance, even at this time, painful to behold. Though I had never seen a case of diaphragmatic pleurisy, I was led to suggest that the trouble was with this structure even before making a careful examination, for I knew of nothing which could produce the peculiar distinctive respiration, found in this patient, except some trouble of the diaphragm.

On examination, the abdomen was found retracted, the diaphragm almost immobile, and the respiration entirely costal. There were points anteriorly and posteriorly painful to pressure. On percussion, some dulness was observed around the lower part of the chest, especially on the right side behind. On auscultation, pleural friction sounds were heard on the left side only; on the right, feeble respiratory murmur, with subcrepitant râles in a circumscribed space at the base of the lung, the inflammation having extended from the diaphragm to the lung and set up a localized pneumonia.

Such being the signs and symptoms in the case, a diagnosis of diaphragmatic pleurisy of tubercular origin, with slight effusion on the right side, was made by my father, Prof. Donaldson. It only remains to say that the patient grew gradually worse, the spot of pneumonia was not resolved, and his lung began to break down. Owing to the great pain that any movement of the diaphragm gave him, he was able to expectorate to a limited extent only, which increased his sufferings and hastened his death.

When we consider the structure and position of the diaphragm, the number of vessels and nerves which pass through it, the organs to which it is adjacent, and the three serous coverings with which it is connected, its pathological importance is apparent, and it is a matter of surprise that so little attention has been given it as the seat of disease.

Primary inflammation of the musculo-tendinous structure of the diaphragm is very rare, though it occurs in the course of acute rheumatism, in penetrating wounds, and in injuries of the chest. Inflammation of the diaphragmatic pleura is much more frequent, and is caused by pleurisy, pneumonia, hepatitis and peritonitis, wounds of the chest and abdomen, fracture of the lower ribs, blows at the base of the chest, currents of cold air on the perspiring body, immoderate laughter, continued crying and weeping, the suppression of rheumatism (Patterson,[1] Portal[2]), the healing of old sores (Aaskou,[3] Boisseau,[4] Selle[5]). Hildebrand[6] considers tight lacing and corsets a cause of this disease.

[1] Trans. of Med Soc. of London, vol. v. No. 32. [2] Loc. cit.
[3] Acta Soc. Med., Havana, t. i. p. 205, 1777.
[4] Nosographie Organ, t. x. p. 620. [5] Loc. cit. [6] Institutiones Médicale, t. iii. p. 267.

Diaphragmatic pleurisy would seem to be most frequent in the adult and in women. It is rare in children, though I find cases reported respectively by Graves,[1] Hildebrand,[2] and one by Jacubusch[3] of an infant but five months old. Diaphragmatic pleurisy is more often unilateral, both sides, however, being affected indifferently. Just here it should be stated that beside the primary inflammation of the diaphragmatic pleura spoken of above, there is a form of so-called *acute benign* diaphragmatic pleurisy, first written of at length by Bucquoy,[4] the tendency of which is always toward cure, and of which I shall treat fully later on.

Secondary inflammation of the diaphragm, though generally overlooked, is none the less frequent. It is most often caused by tuberculosis, and is invariably fatal[5] (Andral,[6] Peter,[7] Howe[8]). It occurs also in those recovering from acute rheumatism (Patterson, Portal, Dubois,[9] Peter[10]). It is usually double and not necessarily fatal. General or partial peritonitis often lights up a secondary inflammation of the diaphragm (Peter,[11] Cuffer,[12] Foix[13]); and Herndon[14] relates a case of perforation of the diaphragm following severe peritonitis. Pitres[15] and Lancereaux[16] were the first to call attention to puerperal peritonitis as a cause of diaphragmatic pleurisy; this form of the malady is always fatal. Charrier,[17] also, in relating the epidemic of puerperal peritonitis observed at the Maternity Hospital, remarks on the frequent coexistence, in such cases, of inflammation of the diaphragmatic pleura. Hervieux,[18] Hilton Fagge,[19] Foix,[20] Laroyenne,[21] Coyne,[22] and others, all remark the frequent production of this disease by puerperal peritonitis, agreeing that the inflammatory products are usually carried by means of the lymph channels, and that the pleurisy is caused directly by a peritoneal abscess which breaks through the diaphragm.

As to the so-called epidemics of diaphragmatic pleurisy observed by Sagar in 1770, and by Boerhens in 1819, it may be said that the epidemics in question were most probably typhoid fever with peritonitis, followed by inflammation of the diaphragmatic pleura. Finally cysts, abscesses, and cancer of the abdominal viscera are often the direct cause of a diaphragmatic pleurisy.

1 Clinical Medicine, 1863, vol. ii
2 Journ. f. Kinderkrankheiten, 1854, vol. xxii. p. 412.
3 Berlin. klin. Wochenschr., Oct. 8, 1883.
4 Leçons Clinique, Paris, 1873.
5 Chauffaud in Hermil. Paris Thesis, 1879, p. 98.
6 Loc. cit.
7 Gaz. des Hôp., 1875, p, 1065.
8 Med. Journ. and Gazette, Feb. 1857.
9 Paris Thesis, 1876.
10 Arch. Général. de Méd., 1871, p. 343.
11 Union Médicale, 1856, p. 562.
12 Bull. de la Soc. Anat., 1874, p. 197.
13 Paris Thesis, 1874.
14 Wien. med. Presse, 1869, x. p. 990.
15 Bull. de la Soc. Anat., 1875.
16 Pro. Méd. Francaise et etrangére, 1879, p. 474.
17 Paris Thesis, 1855.
18 Traité clin. et prac. de mal. puerperale, Paris, 1870.
19 Guy's Hospital Reports, 1879, vol. xix.
20 Loc. cit.
21 Lyons Méd., 1877.
22 Bull. Méd. du Nord, 1877.

As to the frequency of this disease, it must be confessed that it is not very rare. Laurence, Andral, Peter, and de Mussy think it by no means uncommon. It is impossible to give the exact number of cases on record; speaking generally, it is less than one hundred. Doubtless its apparent rarity arises from a failure on the part of physicians to recognize the disease, or, when diagnosticated, to put on record.

Symptomatology.—The onset of diaphragmatic pleurisy is variable. It is usually ushered in by a chill of greater or less violence, followed by fever and sweat. Secondary pleurisy, arising in the course of acute or chronic disease, is marked by an increase of the fever or by a distinct chill; but it is the pain and the characteristic symptoms which follow, that attract attention. In perforation of the diaphragm by bursting of an abscess of the liver, for instance, violent pain and dyspnœa are the prominent symptoms. Intense pain in the side and constriction of the lower part of the chest, soon follow the chill. The pains of diaphragmatic pleurisy are characteristic, and are to be referred to the terminal filaments of the phrenic nerve; they are what Hermil calls "douleurs par propagation."

If we call to mind the anatomy and distribution of the phrenic nerve, we can explain many of the peculiar symptoms found in inflammation of the diaphragmatic pleura. It arises from the third and fourth cervical nerves, receiving a branch from the fifth, and runs through the chest to the diaphragm, where it divides into branches which pierce that muscle separately, and are distributed to its upper and under surface. The nerve, besides its connection with the nerves of the neck and shoulder, supplies filaments to the pericardium and pleura; near the chest it is joined by a filament from the sympathetic and by one from the fifth and sixth cervical nerves. It is also connected with the solar and hepatic plexuses, and gives off filaments to the peritoneum and the suprarenal capsules. The pains of diaphragmatic pleurisy extend, as might be expected, over a large surface—over the whole hypochondriac region and over both flanks to the inferior dorsal region behind, following the line of the costal insertions of the diaphragm, and often along the border of the sternum and under the lower insertion of the sterno-cleido-mastoid muscle, and over the shoulder and neck. The pains may be spontaneous, but are always evoked by pressure or by increased respiratory movements, hiccough, vomiting, etc. According to de Mussy,[1] the favorite seats of pain on pressure are over the epigastrium, at the points of insertion of the tendons of the diaphragm; in the last intercostal space behind, near the spine; along the course of the phrenic nerve; and, finally, at what he calls "*le bouton diaphragmatique*," where the pain is always especially great. De Mussy localizes this spot at a point one or two fingers' breadth from

[1] Arch. Général. de Médecine, 1853, vol. ii. p. 274.

the middle line, on a level with the tenth rib, or at the intersection of a line drawn from the osseous part of the tenth rib and one drawn along the border of the sternum. He explains the greater pain at this point by the greater play of the rib and consequent friction against the inflamed nerve.

The pressure of the liver and spleen on the inflamed pleura serves to explain the pain felt over these organs. The pain along the trunk of the phrenic nerve, referred to above, is rarely spontaneous, but is always evoked by pressure, and especially is this so at the point where the nerve runs under and between the inferior division of the sterno-cleido-mastoid muscle. De Mussy gives a case where great pain was spontaneous at this point. This hypersensibility of the phrenic nerve is explained by its partaking of the inflammation of the diaphragm. Pressure in the intercostal spaces also gives rise to pain. The pains of propagation—the reflex pains—run along the sides, downward even to the iliac fossa, but are usually more intense in the upper part of the body. They are sometimes felt with special intensity in those muscles connected by their nerves with the cervical and brachial plexuses. Supraclavicular pains are generally severe, as well as those in the shoulders and over the scapula and the trapezius muscle generally, the nerves of this entire region being connected through the fourth cervical with the phrenic, as we have stated. The pain referred to the axillary region comes from the connection of the phrenic with the internal cutaneous and the brachial plexus.

Hypersensibility of the phrenic nerve is also sometimes observed in inflammation of the costo-pulmonary pleura and in pericarditis; and it sometimes precedes acute inflammation of these organs and of the diaphragm. Absence of spontaneous and provoked pain at the various parts mentioned was noticed by Graves;[1] and, indeed, in his case pressure upon the painful spots relieved the pain. It seems that in cases of double diaphragmatic pleurisy the pain is always greater on one side than the other. As to the frequency of pain in any given place, that in the hypochondriac region is most often present. In 40 cases given by Hermil, visceral pain was present in 15 cases, special pain at the "bouton diaphragmatique" in 9 cases, pain under the sterno-cleido-mastoid muscle in 20 cases, supraclavicular pains in 7 cases, in shoulder 11 cases, and pains in the axillary region in 2 cases.

The attitude of a person with diaphragmatic pleurisy is very characteristic: The dorsal position being impossible, the body is bent forward, and the hands are applied to the sides in order to immobilize the diaphragm as much as possible. The expression is one of great anxiety and suffering; this peculiar pinched, painful look is more marked where there is a coexistent peritonitis. The convulsive movement of the

[1] Loc. cit.

muscles of the face and mouth, the *risus sardonicus*, is often present, though it is not, of course, as was formerly supposed, a diagnostic symptom of this disease. The most distinctive and prominent symptom in diaphragmatic pleurisy is the frequency and shallowness of the respiratory movements. They are short, aborted, and accompanied with great pain and discomfort to the patient. Respiration is entirely costal and limited, even then, to the upper part of the chest; and, indeed, it may be limited to one side, as in a case given by de Mussy. The number of respirations is, of course, greatly increased, running as high as 80 or 100 (Hayden[1] and Graves[2]). The great trouble and pain in breathing arise, of course, from the interruption in the play of the inflamed diaphragm, kept immobile either by the patient himself, or by a complete or partial paralysis of the structure itself. Paralysis of the diaphragm in such cases is caused directly by the inflamed condition of its pleural surface (a condition somewhat akin to the paralysis of the palate following diphtheria, Stokes),[3] or by a compression of the phrenic nerve by the fibrinous exudation. Again, although there may be no paralysis as such, the effusion may be so large as greatly to embarrass diaphragmatic action. The immobility of the diaphragm in these cases, from whatever cause, is an interesting and instructive symptom, and is the direct cause of the retraction of the hypochondriac region invariably seen in diaphragmatic pleurisy. This sign was held by Galen and the ancients as pathognomonic of this disease. Selle[4] remarks it, and Van Swieten[5] speaks of the *quiescente abdomine*. The diaphragm being to a great extent immovable, it forms a more or less elastic division between the chest and abdomen, the movements of which are in opposition to each other, and are exactly the reverse of those of normal respiration. The paralyzed diaphragm is an inert partition, which follows the respiratory movements instead of directing them.

Paralysis of the diaphragm, however, is rarely complete and usually unilateral, and in most cases the immobility of the diaphragm is due to the pain caused by any superfluous movement. Of course, the effusion may be so great as to cause not only a paralysis, but a complete sagging of the diaphragm, and great displacement of all the abdominal organs, as in a case of pyopneumothorax seen by the author.

Respiration being so much impeded, auscultation gives very negative results. Great enfeeblement of the respiratory murmur on the affected side, a few subcrepitant râles at the base of the lung from its imperfect expansion and involvement in the inflammation of the adjacent pleura, and pleural friction sounds over the diaphragmatic area, are the only signs present to the ear. Laennec declared ægophony to be present in

[1] Dublin Quarterly Journ., 1871, vol. lii.
[2] Loc. cit.
[3] Dublin Quarterly Journ., 1836
[4] Loc. cit.
[5] Commentaria in Aphor. Boerhaave, vol. ix., 1771.

diaphragmatic pleurisy on theoretical grounds, and the experience of Skoda would seem to confirm the statement. More or less dulness immediately around and above the diaphragm is present on percussion.

The cough is frequent, dry, and exceedingly painful; the expectoration slight and thin. Where the inflammation extends to the costo-pulmonary pleura, we have, in addition, all the signs of this affection. In cases of diaphragmatic pleurisy with effusion, de Mussy gives, as an important symptom, the *lowering* of the twelfth rib, so that its anterior end is lower than that of the twelfth rib on the opposite side. This sign is given by Chauffaud in a case quoted by Hermil.[1] In cases of effusion there may be slightly increased Skodaic resonance on percussion over the attachments of the diaphragm.

Hiccough is often a distressing symptom in this malady, and was at one time considered diagnostic. It has no absolute value, however, for it is also present in circumscribed peritonitis of the superior part of the abdomen. Sometimes it is present from the very beginning in inflammation of the diaphragm; Vergely[2] gives such a case, which was rapidly fatal. Nausea and vomiting, too, are often extreme, and icterus has been noticed in two cases of right diaphragmatic pleurisy by Hermil,[3] and also by Andral[4] and Monod.[5] It is, of course, caused by the extension of the inflammatory process from the diaphragm to the liver.

Dilatation of the stomach has been met with by Peter,[6] who was the first to call attention to it as a complication of this disease, and also by Laporte.[7] It proceeds from an inflammation of the peritoneal covering of the stomach, which later invades the muscular structure of this organ, causing it to lose more or less of its tonicity, and to be easily distended by gases, etc. Violent pain when a bolus of food passes the œsophagus at its passage through the diaphragm is a symptom sometimes met with in diaphragmatic pleurisy.

Great delirium is often present, though it is not an essential symptom of this disease, as was formerly supposed. That it is present more often in this malady than in costo-pulmonary pleurisy is explained by the greater dyspnœa and want of aëration of the blood. Coma sometimes sets in at once, in which case the disease runs rapidly to a fatal termination. The pulse is small and rapid. The temperature runs usually from 38° to 39° Centigrade, though it rises much higher when the diaphragmatic inflammation is complicated with some other malady.

The course of diaphragmatic pleurisy is variable. In primitive cases the invasion is rapid, the symptoms reaching their greatest intensity quickly, and subsiding in the same manner. Double pleurisy rarely

[1] Loc. cit., p. 98.
[2] Gaz. des Hôp, 1873.
[3] Loc. cit.
[4] Loc. cit.
[5] Hermil, p. 77.
[6] Clin. Méd., vol. i. p. 400, and Journ. de pract. méd. et Chir., 1874, p. 299.
[7] Paris Thesis, 1869.

begins as such, one side being affected first. Secondary pleurisy is often complicated by pericarditis, peritonitis, etc., and generally ends fatally. The duration, too, is variable; the acute symptoms are more prolonged than in ordinary pleurisy. The neuralgic pains along the course of the phrenic nerve often continue for a long time, with tenderness over the insertions of the diaphragm.

Diagnosis.—The *diagnosis* of diaphragmatic pleurisy is at best difficult and uncertain; and unless great care be taken, the disease will pass unrecognized. The diagnosis cannot be founded on any one particular sign or symptom. Andral went so far as to say that inflammation of the diaphragm might exist without being announced by any characteristic symptom. De Mussy, however, holds that by careful differentiation we may always arrive at a satisfactory diagnosis. He lays great stress on the value of the "diaphragmatic button," for in no other malady does pressure on this particular point cause pain and dyspnœa. The prominent symptoms, then, to be looked for, are spontaneous and provoked pains in the places and regions already described; immobility of the abdominal walls and the epigastric "hollow;" the peculiar type of respiration; dulness on percussion over the diaphragmatic area; pleural fremitus; absence of respiratory murmur; hiccough; vomiting; pleuritic cough, etc. Nearly all the authors, from Galen to Joseph Frank, have discussed the relation between diaphragmatic pleurisy and pleuritis or meningitis. Morgagni[1] and De Haen[2] give observations to prove that delirium may be entirely absent in the former disease. Joseph Frank[3] goes further, and declares that delirium and sardonic laugh belong no more to this affection than to inflammation of other organs. De Mussy, however, thinks (as do most observers) that delirium is more frequent in diaphragmatic than in costo-pulmonary pleurisy. Again, the absence of the positive signs and symptoms of disease in other and adjacent organs, must be well noted. In cases of greater or less effusion, the diagnosis is less difficult, because of the displacement of the liver and spleen, and of the abdominal organs generally.

Acute diaphragmatic pleurisy is to be differentiated from

I. *Rheumatism of the diaphragm.* Rheumatism of this structure is pyretic, the fever gradually increases for from one to eight hours,[4] and the acute symptoms terminate spontaneously and without complication. It is unaccompanied by pain on percussion at the points described above, the pain being limited to the insertions of the diaphragmatic muscle.[5]

II. *Inflammation of the muscular structure of the diaphragm itself.* Such a diagnosis it is almost impossible to make, though it is to be re-

[1] Loc. cit. [2] Loc. cit. [3] Loc. cit.

[4] Chenevier, Gaz. des Hôp., 1858.

[5] Fernet, N. Dict. de méd. et Chir. prat, Paris, 1869, xi. 344.

membered that the latter is a very rare affection, and results from wounds or abscesses only.

III. *Neuralgia of the diaphragm*, which in itself is often a symptom or result of acute inflammation of the diaphragm. When it is present, we must get at its cause, whether it is dependent on some affection of the heart, or great veins, or on anæmia, hysteria, etc. The absence of fever, however, the side affected, and the intensity of provoked pains will greatly assist in diagnosis.

IV. *Costo-parietal pleurisy.* In this disease, though the pain in the side is as great as in diaphragmatic pleurisy, the seat of the pain is higher up, and, above all, it is accompanied by the well-known percussion and auscultatory signs which are wanting in diaphragmatic pleurisy. Of course, they may and do exist together. Peter[1] gives a case of diaphragmatic pleurisy with encysted effusion in a phthisical patient which was overlooked and mistaken for caseous pneumonia on account of the compression of the lung by the fluid.

V. *Pericarditis.* In pericarditis we sometimes have pain along the course of the phrenic nerve; when such pain is present, however, the heart affection is complicated by some other disease, as in a case recorded by Bouillaud[2] of a pericarditis with purulent pleurisy, involving the diaphragm. De Mussy gives the differential character of the pain in diaphragmatic pleurisy and pericarditis somewhat as follows: Whereas, in the former the principal point of pain is in the "bouton diaphragmatique," on the right side, in the latter it is in the costo-ziphoid angle, on the left side, and immediately under the ziphoid appendage. The dyspnœa, too, is much less in pericarditis, and the physical signs on auscultation and percussion are distinctive, though the pericarditis may be concurrent with an inflammation of the left side of the diaphragm; eight such cases are reported by Hermil.

VI. *Hepatitis.* Right diaphragmatic pleurisy, with icterus, bilious vomiting, and displacement of the liver, may naturally be mistaken for acute hepatitis, which last, however, is a very rare disease with us. In it there are no painful points as in pleurisy, no great dyspnœa, no difficulty in the dorsal position; further, the pain produced by the pressure of the enlarged liver on the diaphragm is distinct from that produced by inflammation of the diaphragm itself.

VII. *Circumscribed peritonitis* of the superior part of the abdomen. A differential diagnosis in this case is often very difficult, for the affections have in common the superficial pain over the abdomen, increased by pressure, the radiating pains extending from below upward even to the shoulder. The pulse in both is very small and frequent, and dys-

[1] Gazette des Hôp., 1875, p. 1065.

[2] Traité Clin. d Rheu. Artic., Paris, 1840.

pnœa, hiccough, vomiting, dilatation of the stomach, icterus in cases of perihepatitis, all are sometimes present in peritonitis.

In peritonitis, however, we must seek for those symptoms apparently the least prominent; the functional troubles of each viscus found in peritonitis, and, above all, we must look for the antecedent cause of inflammation of the peritoneum, as cirrhosis, and cancer of the liver, or other organs. Thus, in a case given by Hermil,[1] though the physical signs and symptoms were very misleading, the extreme dyspnœa, with absence of tumefaction on the right side, and of any swelling of the abdomen; and absence of vomiting and icteric taint; the consolidation of the bases of both lungs and the characteristic pains over the bouton diaphragmatique, settled the diagnosis of diaphragmatic inflammation. Furthermore, it would seem that whenever hiccough exists in peritonitis, it is always followed by vomiting (Charrier[2]). Peritonitis according to Foix[3] and Hilton Fagge,[4] is often complicated with diaphragmatic pleurisy, and in such cases the diagnosis is very difficult. Hervieux[5] says that the absence of cough and expectoration, of lung consolidation, and auscultatory signs, is sufficient. Again, it is very difficult to distinguish an encysted supradiaphragmatic effusion from a subdiaphragmatic collection (Donaldson).[6]

Complications and Terminations.—Diaphragmatic pleurisy is usually complicated with pneumonia, costo-pulmonary pleurisy, pericarditis, perihepatitis, and perisplenitic peritonitis. Williams[7] says that peritonitis following diaphragmatic pleurisy is rare, though he gives a case of general peritonitis with inflammation of the under surface of the diaphragm following this disease. Cailliete[8] also gives two cases of fatal peritonitis produced by inflammation of the diaphragm. Petit,[9] too, gives a case of perforation of the diaphragm, with fatal peritonitis, following a diaphragmatic pleurisy. The termination in primitive cases is in cure, as will be seen later. In secondary cases it is usually fatal, about one-fourth only of such cases recovering. When an effusion forms, it is either absorbed or becomes purulent, and the patient either lingers a long time, or the collection becomes encysted. In the latter case, it either remains inert, producing no particular bad effects, and attracting no attention, to be found after death from other causes (Graux,[10] Boisseuil[11]); or it ulcerates through the diaphragm, causing death (Andral[12]). Or, again, it may be ejected through the lungs. Grisolle[13] gives a case where the pus of an encysted effusion was evacuated partly

[1] Loc. cit., p. 60.
[2] Paris Thesis, 1855.
[3] Paris Thesis, 1874.
[4] Guy's Hospital Reports, 1873.
[5] Loc. cit.
[6] Pepper's System of Medicine, Art. Pleurisy, p. 563.
[7] Soc. Méd. des Hôp., 1873.
[8] Paris Thesis, 1874.
[9] Bull. de la Soc. Anat. de Paris, 1866, xli. p. 497.
[10] Bull. d. l. Soc. Méd de Paris, 1874, p. 478.
[11] Paris Thesis, 1876.
[12] Loc. cit., vol. ii. p. 465.
[13] Path. Interne, vol. i. p. 438.

through the lungs and partly through the lumbar region, and which resulted in cure. De Mussy[1] also tells of two cases of cure after evacuation of the pus through a bronchus.

Prognosis.—Briefly, in primitive pleurisy, the tendency is toward cure. In secondary cases the prognosis is always grave, especially where it occurs in those of tubercular diathesis, and in cases of great delirium, obstinate hiccough, and of bilious vomiting; of excessive dyspnœa and of a purulent effusion. Double diaphragmatic pleurisy is not, as a rule, of grave import. Inflammation of the left side of the diaphragm is of more serious import, owing to the occasional involvement of the pericardium. Pleurisy occurring in the course of puerperal fever is extremely fatal.

It only remains for us to speak of the so-called benign form of diaphragmatic pleurisy to which attention was first called by Bucquoy,[2] and which would seem to be a distinct form of the disease. According to this writer, besides ordinary acute pleurisy, with more or less effusion, and that accompanying bronchitis or catarrhal pneumonia, with little or no effusion, and lasting a short time, there exists a separate and distinct form of acute benign diaphragmatic pleurisy, which always ends in cure. Hermil[3] agrees with Bucquoy in this opinion, and says that he has seen a number of such cases. I find also that the articles on inflammation of the diaphragm published since 1879 treat exclusively of this somewhat peculiar and interesting form of acute benign pleurisy. Bouchut[4] confirms Bucquoy's statements, and gives three cases of acute benign diaphragmatic pleurisy, all ending in cure. Monod[5] and Robert[6] each report one case identical with the above; and Fiessinger[7] nine cases, all ending in rapid and complete recovery.

Acute benign diaphragmatic pleurisy begins, as does ordinary pleurisy, with chill, pain in the side, and fever. The painful points and radiating pains, the tender and retracted abdomen, etc., follow, and show conclusively that the inflammation is of the diaphragmatic pleura. Up to the third day the inflammation is limited to one side only, but from the third to the sixth day it extends, and we find the opposite side of the diaphragm involved. Its invasion of the other side is accompanied, however, by no great pain, and indeed all the symptoms are much less than those of the side first affected. There is some slight consolidation of the lung bases with enfeebled respiration; there is but slight effusion and little displacement of the liver and spleen. While all the symptoms are much less pronounced on the side last affected, the

[1] Arch. de Méd , July, 1879.
[2] Leçons Clinique, etc., Paris, 1873.
[3] Loc. cit., p. 50.
[4] Paris Méd., June 17, 1880.
[5] Gaz. Heb. d Sc. Méd. de Bordeaux, 1880, i. p. 751.
[6] Revista de Cirucias Medicas, Barcelona, 1881, xii. p. 3.
[7] Rev. Méd. de l'est., Nancy, 1885, xvii. p. 332.

effusion on the side first involved rises to a much lower level than that of the opposite side. On the side first attacked we usually have a certain amount of retraction of the base of the lung from the presence of the fluid between it and the diaphragm. This fluid, however, does not always occupy this place, but by reason of the retractility of the lung, which draws the fluid upward with it, the liquid is spread out, as it were, between the lung and the thoracic wall, and so we may have the physical signs of a large effusion, though, in fact, the amount actually thrown out is quite small. As a rule, in benign pleurisy the bilateral effusion disappears without surgical intervention, and the dyspnœa, in spite of the double pleurisy, is but slight.

Another interesting feature of this benign form of diaphragmatic pleurisy is that the last pleurisy developed is the first to disappear. Pending its duration, however, there is little or no progress of the disease on the side first attacked. The development of the second pleurisy would seem to arrest the first, and the tendency is toward rapid cure. There is, in general, but little systemic disturbance, and the fever is moderate in this form of the malady. The extension of the inflammation from one side to the other seems to lessen all the bad symptoms. All such cases result in cure in from two to four weeks (Monod,[1] Hermil[2]).

[1] Du Hermil, pages 73 to 77.

[2] Loc. cit., p. 66.