Continued observations on haemoptysis / by Vald. Rasmussen ; translated from the Hospitals-Tidende by William Daniel Moore.

With the Translator's Kd Regards

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CONTINUED OBSERVATIONS

ON

HÆMOPTYSIS.

By Dr VALD. RASMUSSEN.

TRANSLATED FROM THE "HOSPITALS-TIDENDE,"

Copenhagen, March 17 *and* 24, 1869,

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CONTINUED OBSERVATIONS

ON

HÆMOPTYSIS.

In a former essay,[1] based upon my own observations, I have endeavoured to give a description of hæmoptysis in its anatomical and clinical bearings; and, in particular, I have, in eight cases of hæmoptysis in patients with chronic pulmonary phthisis, to which, during the preparation of my paper, a ninth was added, demonstrated the constant origin of the hæmorrhage from cavities by rupture of ectasias or aneurisms on small branches of the pulmonary artery, running in the walls of cavities. Since that time I have had the opportunity of making two dissections of patients who died during attacks of hæmoptysis, which I shall now take leave to communicate, as they form a very satisfactory supplement to my former observations, which they in all points confirm, and in some respects extend and complete.

I. (10th) Case.—*Phthisis cavernosa pulmonum. Aneurisma ruptum art. pulmonal. in cavernam bronchiectat. Ulcerat. tubercul. coli.* —Emmy Emilie Larsen, aged 18½ years, unmarried, admitted on the 12th May 1868 into the second division of the Kommune Hospital. Her father died of disease of the chest; her mother, brothers, and sisters are said to be in good health. As a child she had ulcerations on the sides of the neck, on the arms and legs, which have left white, streaked, deep cicatrices. Regular menstruation, which commenced in her fourteenth year, ceased four months ago. She was always inclined to cold, with cough and dyspnœa. She was confined once a little more than a year ago; the child is healthy. During the last two months she has incessantly had troublesome cough, with expectoration speckled with

[1] *Hospitals-Tidende*, 1868, Nos. 9–13. Edinburgh Medical Journal, 1868, November and December. Translated by W. D. Moore. British and Foreign Medico-Chirurgical Review, January 1869, and elsewhere.

yellow, but never mixed with blood; the dyspnœa has increased, and she is greatly emaciated; her sleep has been disturbed, accompanied with violent perspiration. No appetite, great thirst, and latterly diarrhœa from four to eight times in the twenty-four hours. She has, however, got up, but has been so weak that she could not work (sew).

On examination, she was found to be emaciated, slight, very pale; her skin was burning hot, her chest emaciated, sunk in above and beneath the clavicles. On physical investigation, the usual signs of large cavities in the upper lobe of both lungs were met with, especially on the left side. The abdominal organs presented nothing abnormal. The tongue was half dry; she complained of a bad taste in her mouth, some thirst; pulse 84. On the 15th of May there was some improvement. On the 18th there were spots of blood in the expectoration, which disappeared the next day. On the 29th blood was again seen in the expectoration. The cough became more troublesome, the nocturnal perspiration and diarrhœa were very considerable, and her strength already began to fail greatly. On the 24th June the following entry appears in the journal:—"The patient's condition was yesterday as usual. Early this morning she got a fit of coughing, and brought up a mouthful of frothy blood, and immediately fell back and died."

The post-mortem examination was made twenty-eight hours after death. Cadaveric rigidity, body much emaciated, heart small, healthy. Both lungs very firmly attached to the thorax by dense cicatricial layers of connective tissue, especially in the apices, which layers, particularly in the right lung, were one centimètre in thickness. In the apex of this lung, a cavity of about the size of a duck-egg is seen, very much elongated and sinuous, bounded everywhere by an almost cicatricial tissue, in which are found only slight remains of pigmented pulmonary tissue. Beneath this cavity are found some smaller cavities, the smallest being only about the size of a nut, and lodged in a perfectly similar tissue. None of these cavities, into which bronchi everywhere open with eyelet-hole orifices, contain blood, but only a puriform, in some cavities, slightly chocolate-coloured fluid. Beneath this part, which occupies about the upper third of the lung, the tissue is completely permeable to air, with scattered miliary tubercles in moderate quantity, most frequently with a well-marked peribronchitic character. On more careful examination of the boundary between these two parts, a cavity of the size of a large pea is found, forming as it were an ampulla-like dilatation on a bronchus of the thickness of about a crow-quill. The bronchial wall itself can be traced in its continuity only a little beyond its entrance into the cavity; otherwise it is bounded by a layer of condensed pulmonary tissue of about one millimètre in thickness, outside which the tissue is permeable to air, with a moderate amount of the tubercles above mentioned. Into this cavity projects a swelling of the size of a large grain of shot. It is

situated close to the opening, and is found to be a small aneurismatic dilatation on a branch of the pulmonary artery accompanying a bronchus, which dilatation, when slit up, measures three millimètres.

This aneurism burst with a small slit-like fissure; from the opening a large, firm, decolorized coagulum projects, and the inside of the aneurism itself is invested with a thin layer of firm, light, red fibrin. All the bronchi to the lower lobe are filled with coherent coagula of blood, and likewise throughout the pulmonary tissue small light-red hæmorrhagic infiltrations are seen.

The bronchial glands are greatly swollen, of a light-gray colour, firm, here and there pigmented.

In the pleura and its adhesions is no perceptible miliary deposition.

In the left lung are similar smaller cavities not filled with blood; they are circumstanced in all respects essentially like those on the right side.

In the large bronchial trunks on both sides a large amount of blood is met with; it is found in smaller quantity in the trachea. In this, as well as in the larynx, nothing else abnormal is discoverable.

The spleen is somewhat enlarged, firm, with numerous and large follicles.

The kidneys are cyanotic, without any miliary deposition.

The liver also is cyanotic.

The mesenteric glands are only slightly swollen; they are pale.

In the small intestine, some follicular swelling is met with, especially about the ileo-cæcal valves. In the large intestine, several irregular, sinuous, large ulcers are found, partly smooth, partly with distinct miliary deposition; several seem on the point of healing.

This case is one of no slight interest. In the first place, as to the clinical course of the hæmoptysis, we see such occur, and for the first time, in a patient with pulmonary phthisis already far advanced, in the beginning only as a few spots of blood, and ten days later tolerably violently; it ceases, while the hectic condition is still further developed, though without signs of secondary pneumonic infiltrations, and not until a month later does the fatal hæmoptysis come on, not profusely, as we are accustomed most frequently to see it, but even very sparingly, only a tablespoonful of blood being brought up, while death nevertheless takes place very rapidly and suffocatively by obstruction of the bronchi in the hitherto sufficient parts of the lungs. This condition is, however, according to my former observations, not so striking; for, in such advanced phthisis, death may occur without even so much as a drop of blood reaching the mouth, as my sixth case shows.

This case presents greater interest, however, in an anatomical point of view; I shall therefore examine the results of the post-mortem examination more closely. We found in the apex of the

right lung a large cavity, bounded by dense, cicatricial tissue, and below it some smaller cavities lodged in a similar tissue. They contained no blood, nor was there, to judge from the cicatricial appearance of the whole of the adjoining tissue, any reason to suppose that the hæmorrhage could proceed from any of these cavities; on the contrary, the bronchi were everywhere filled with blood. This case seemed therefore really to afford decisive evidence in favour of the correctness of the opinion hitherto generally received as to the broncho-hæmorrhagic origin of the blood. I should scarcely have been in a position to demonstrate the true source of the latter, if I had not had in my previous investigations so firm a standing-point, and a decided conviction, thence derived, that it must be sought in a cavity. I therefore took three sections from the boundary between the completely condensed and the still permeable parts of the lung, and in this manner I soon succeeded in discovering the little cavity, which, notwithstanding its minuteness, had all the characteristic properties of a bronchiectatic cavity of some standing. A very small artery accompanied the bronchus leading to the cavity, and at the point where it touched the latter the small aneurismatic dilatation was found.

What further deserves our attention in this case is the coagulum met with. In my first essay, I had not concealed the difficulties which presented themselves in the explanation of the observation, so important in a clinical point of view, that hæmorrhage demonstrably proceeding from small aneurisms which have burst into cavities may occur remittingly or even intermittently. Those remitting hæmorrhages seem not to be accidental; for, of the four aneurisms in cavities observed by me, they were met with in three, and the same was the case in the two similar foreign observations of Cotton and Fearn. These remitting hæmorrhages stood in striking contrast to the sudden death occurring with violent hæmoptysis in ectasias in cavities with operculated rupture, and it was therefore evident that these remissions in the hæmorrhage in the aneurisms must be due to peculiar conditions in the latter. What would naturally occur to one in the first instance was, that in the aneurisms coagula existed, which, as in hæmorrhages from aneurisms in larger vessels, permitted only an oozing, or, at all events, the escape of only a small quantity of blood; but such coagula I had never been in a position to demonstrate in either ruptured or whole aneurisms; and although I hinted that in the first case they might possibly have escaped with the strong current of blood, I did not feel myself justified in abandoning the strictly anatomical foundation on which my essay was based. I had, in fact, at least in one case, unmistakably observed a punctated, fatty degeneration of the aneurismatic wall, and I therefore supposed, that from the first a small opening had probably formed, which had been closed by a coagulum, and that a larger rupture had taken place at a subsequent period of the progressive fatty degeneration. In this instance, on

the contrary, a distinct fibrinous deposit of some standing was found on the inside of the aneurism, and out of the ruptures protruded a large, firm, decolorized coagulum of some standing, which the comparatively feeble current of blood in all probability was not sufficiently powerful to carry away. It therefore appears to me that we are justified, according to this case, in assuming that these remitting hæmorrhages, as, moreover, seems most natural, were due to obstructing coagula.

The rapid occurrence of death in this instance was due, as I have mentioned, chiefly to the patient's advanced phthisis, and the slight power of resistance she consequently possessed. Had such a hæmorrhage occurred in a still vigorous individual,—for example in the patient formerly mentioned in our first case,—we shall, when we take all the circumstances in the earlier case into consideration, scarcely be able to deny the possibility that the hæmorrhage might have been definitively arrested, as the aneurism and its afferent little vessels had become filled with obstructing coagula, which had gradually been organized. Matters were here singularly favourable: a small aneurism on a little vessel, and a very small cavity with a single outlet. This case is therefore interesting also, as it seems well adapted, if not to prove—for a positive proof on this point can scarcely be adduced—at least to make it probable, that hæmoptysis during the course of chronic pulmonary phthisis, in many instances in which it does not directly induce death, depends on similar ruptures of small vessels in small cavities with insufficient outlets, as I described in my former essay. Without repeating what is there stated, I shall only once more allude to the fact that hæmorrhages, demonstrably proceeding from rupture of aneurisms into cavities, in no respect differ from any other hæmoptysis occurring during the course of chronic phthisis.

Further, it cannot be denied, that such a small bronchiectatic cavity as that in the case before us was in its development—as, moreover, its location in the transition to the permeable parenchyma indicated—may be found in an apparently healthy individual, and therefore may also become the starting-point of an hæmoptysis; and, according to my experience, it cannot be matter of surprise, that I look upon the cases of hæmoptysis in perfectly healthy individuals, reported by authors, with suspicion, and am inclined to refer the source of the hæmorrhage to such a small overlooked cavity. This is a view which I have on a former occasion expressed, after I had seen a cavity of the size of a nut give rise to fatal hæmorrhage, and which in this last observation, where the cavity was of the size only of a large pea, appears to me still more probable. I of course except those cases where the hæmoptysis is vicarious—if such vicariousness, of which I myself have no experience, really does exist—and possibly also the cases, though they are rare, of intermittent hæmoptysis in destructive malarial fevers (Febr. perniciosa hæmoptoica).

II. (11th) Case.—Chr. Fredr. Vilh. Schroeder, aged 41, formerly a periwigmaker, has, for many years, been an inmate of the General Hospital on account of chronic pulmonary phthisis. He has almost constantly been able to be up, but suffered from a persistent and rather violent cough, with expectoration; this has, for the last fortnight, been somewhat tinged with blood; but only on one day, three days before his death, was a small quantity of clear blood brought up. On the morning of the 7th December 1868, after he had drunk his tea, feeling as usual, he got, while he was at stool, an attack of profuse hæmoptysis—he complained particularly of violent pains in the præcordial region, which caused him to cry out.

He was at once transferred to the Infirmary, where the usual remedies were applied. The hæmorrhage seemed to diminish, but the violent pains in the præcordium continued, rendering the subcutaneous injection of morphia necessary. No sooner, however, was the point of the syringe pushed through the skin than the blood streamed afresh from his nose and mouth, and in a few minutes he was dead.

The post-mortem examination was made next day. Cadaveric rigidity; body rather emaciated.

The heart is of the usual size, flaccid; contains loosely coagulated masses, and scattered œdematous fibrinous coagula.

Both lungs, especially the right, are firmly adherent to the thorax. The right upper lobe is strongly retracted, changed into a cicatricial mass, in which only here and there are seen scattered remains of pigmented pulmonary tissue. On the surface of section are found some, most frequently elongated, small cavities with smooth, connective-tissue-like walls, and moderately dilated bronchi; in these, as well as in the cavities, is found abundant thin, rather dusky, blood. Nowhere are any miliary or peribronchitic depositions met with.

The anterior edge of the left lung and the upper part of its anterior surface has a rugged appearance, due to a very considerable emphysema, the vesicles in some places attaining to the size of a walnut. In the apex, and somewhat down along the posterior margin, is a cavity of the size of an egg, reaching posteriorly to the greatly thickened pleura. In passing from the anterior to the posterior wall, about the middle, on washing away the abundant, loosely coagulated or fluid blood, which forms the contents of the cavity, a prominence of the size and shape of a large pea is met with. This is formed by an aneurismatic dilatation, which, in the whole length of its upper surface, presents a gaping fissure, with thin, scarcely yellowish edges, which, nevertheless, inferiorly towards the passage of the aneurism into the wall of the cavity, become perceptibly thickened. On slitting up the pulmonary artery, the branch on which the aneurism is situated is found to have a diameter of five millimètres, and to be a branch only half a centimètre in length from one of the main trunks. The efferent branch is so minute that it admits only a horse-hair, and is quickly lost in the bottom of the

condensed wall of the cavity. This wall has inferiorly a thickness only of three or four millimètres, and to it the permeable pulmonary parenchyma directly reaches. On different parts of the wall of the cavity, eyelet-hole bronchi open.

The rest of the lung is permeable to air, only in the inferior lobe are here and there collected, in small groups, large yellowish tubercles with a distinct cavity, and in the immediate surrounding of these are scattered miliary tubercles. In all the bronchi, even to the lower lobe, is thin blood.

There is no evident miliary deposition in the pleura. The mucous membrane in the bronchi is thickened, deeply tinged with blood. In the larynx and trachea is nothing abnormal except blood. The follicles at the root of the tongue are greatly swollen.

The spleen is rather large, swollen, soft, with numerous large follicles; no trace of amyloid change.

The liver is very large and heavy, with characteristic and very extensive amyloid degeneration.

The kidneys are of the ordinary size, and exhibit only slight parenchymatous, but no amyloid changes.

The other organs present nothing abnormal.

In this case also we see hæmorrhages preceding the last fatal attack, at first sparingly, as an imbibition of the expectoration, and finally, three days before death, we have a more copious bleeding. Death occurred during a violent attack of hæmorrhage, which has, however, diminished, to return after the lapse of an hour, and immediately terminate fatally. The rupture of the aneurism was accompanied by an unusual phenomenon, which was never observed in any of the former cases—namely, an exceedingly violent pain in the cardiac region, for which the post-mortem examination did not indicate any special cause. It is remarkable that the complete rupture, with the extrusion of the obturating coagulum, which, in all probability, had been present and prevented instantaneous death, did not occur before, when the loud cry, which the violent pain forced from the patient, was uttered. That in this case, too, there had been an obturating coagulum, which had been forced out with the last and fatal hæmoptysis is indubitable; the great gaping slit in the aneurism, the tolerably large vessel on which the latter was situated, and the almost direct connexion of the aneurism with one of the principal trunks of the pulmonary artery, make it clear that the patient must have died instantaneously, if such a coagulum had not existed. The cavity was in this case large; it may, however, as our former observations show, be still larger, and it had the thin wall almost peculiar to these aneurism-bearing cavities, with which the relatively healthy and still permeable parenchyma is in direct contact.

The cases I have collected, and in a comparatively short time, are, therefore, eleven, in which we have demonstrated the constant

occurrence of the hæmoptysis from cavities ; and it deserves to be remarked, that, since these investigations commenced, we have not had the dissection of a single case where this source of the hæmoptysis has not been demonstrated. This number, although in itself small, may, nevertheless, in proportion to those of other investigators, be even called very large ; it is, at all events, sufficient to exclude every possibility of the accidental, and, as I hope, also to give a tolerably clear idea of the most essential circumstances under which these aneurisms and ectasias, so eventful for the patients, are developed. I shall further remark only, that I never remember to have seen any case of rupture of a vessel running in a trabecula passing through a cavity, as is generally stated by authors.

The reports from other quarters of cases of hæmoptysis from ruptured aneurisms are as yet but very few ; I shall therefore refer to one recently published in the *Medical Times and Gazette*, January 16, 1869, page 66. The case occurred in the Victoria Park Hospital, under the care of Dr Birkett. The post-mortem examination was made by Dr H. G. Sutton. The reporter of the case calls attention to the interesting clinical fact, that rupture of the aneurism did not immediately cause death. He explains this, as I have done, by the presence of an obturating coagulum, and points out the resemblance of the minor hæmorrhages in this instance to what is frequently seen when aneurisms of the chest and abdomen open on mucous surfaces. Dr Sutton stated that, in 1859 and 1860, he observed two similar cases, which, however, are not described. It is further stated that, in the last eleven and a half years, 16 patients have died in the hospital of hæmoptysis, and 321 of phthisis ; so that very little more than 5 per cent. of those labouring under and dying with phthisis have suffered from fatal hæmoptysis while in the hospital ; and the writer therefore assumes, as almost all other authors do, that fatal hæmoptysis is very rare. In my former essay I have shown that it is not possible from hospital statistics to deduce any reliable inference as to its frequency, as it is a matter of chance whether the aneurism bursts during the patient's stay in hospital, and death usually occurs so rapidly that they have not time to reach it.

Secondary Hæmoptysis after penetrating Gunshot Wounds of the Chest.

Immediately after a penetrating gunshot wound of the chest, hæmoptysis usually sets in, and the amount of blood brought up is generally in proportion to the greater or less degree of direct violence the lung has suffered. These hæmoptyses are in general only of short duration, which is essentially due to the strong compression to which the lung is at the same time subjected, partly in consequence of the entry of air and blood into the cavity of the pleura, partly as a result of the pleuritic effusion which rapidly fills the cavity of the pleura ; moreover, the secondary circumscribed

pneumonia ordinarily developed about the lacerated pulmonary tissue will, by filling the air-cells with a dense exudation, compress the vessels; and in all probability, too, the peculiar contusion which the pulmonary tissue suffers, from the passage of the ball through it, will favour coagulation in the torn vessels. No special importance is attached by military surgeons to these hæmoptyses, and they are of far less consequence than the following dangerous leading symptoms attending penetrating gunshot wounds: pneumothorax, hæmothorax, and pleuritis.

Hæmoptysis may, however, occur after penetrating gunshot wounds, long after the external wound is healed, and it is to these hæmoptyses, which may thus be called secondary, that I would direct attention, as, so far as I have had access to the literature of the subject, they are not mentioned by writers. The case which I have myself had an opportunity of observing is the following:—

Captain D., of the 3d Regiment, aged 39, who had formerly always enjoyed good health, with the exception of having, as it seems, in 1852 passed through a slight attack of pneumonia of the left side, was, at the capture of an outpost at Dybböl, on the 14th March 1864, wounded at a short distance by a rifle-ball in the left side of the chest. He at once fell to the ground, and the blood streamed out of his mouth; he had difficulty of breathing, and felt violent lancinating pains in the wound, from which only a small quantity of blood oozed out. After temporary bandaging at the ambulance, he was brought to the hospital at Augustenborg; on the way thither the dyspnœa increased considerably, so that he could bear the motion of the waggon only for a few minutes at a time, and the hæmoptysis continued. On more accurate examination of the wound, it was found to be penetrating.

For the first fourteen days he had moderate fever, but he seems, with the exception of the hæmoptysis, not to have had any of the prominent signs of a penetrating wound; particularly, there was no escape of air through the wound, nor any accumulation in the cavity of the pleura, and the hæmoptysis steadily diminished, so that even on the 31st March he was able to be removed to the hospital at Frederiksberg Castle. He was there placed under my care.

On examination, the track of the ball was found to be nearly six inches in length, in a direction from before backwards; the opening of ingress lying nearly in the anterior axillary line, close to the lower edge of the sixth rib; the opening of exit posteriorly about half an inch lower. The edges of the wound were swollen, red; the whole wound was painful to the touch, slightly suppurating; no fracture of the ribs was perceptible; respiration was superficial, rather free; on deeper inspiration the shooting pains in the wound became violent; the patient was allowed to lie only on his back. Only a single blood-coloured clot was brought up during the first days. Pulse natural, general state very good. Physical examination showed no sign of accumulation of air or fluid in the cavity of the

pleura, nor any infiltration of the lung; respiration was everywhere natural, only in the vicinity of the wound was it rather feeble.

During his further stay in the hospital the pains gradually diminished, the respiration became freer; splinters of bone of various sizes were repeatedly separated. On the 30th of April he was able to begin to get up. On the 1st of September the wound was healed, with the exception of a short fistulous passage, so that he was able to leave the hospital; the wound was not, however, perfectly healed until towards the close of the year.

On the 28th of November 1866, when feeling perfectly well, and without any cause, he suddenly got a very violent attack of hæmoptysis. From this time he continued to bring up clear blood, though in much smaller quantity, or a bloody gruel-like fluid with slight cough, generally after pricking pains, and a feeling of oppression in the region of the wound. He kept his bed for four weeks, after which time the hæmoptysis became less frequent, but it took place every time he either stooped down much or lay on the left side. The stethoscope revealed only slight feebleness of respiration in the neighbourhood of the wound. In July 1867 he went by easy stages to Eaux-bonnes, in the Pyrenees, where he remained for five weeks. The hæmoptysis, which had continued the whole time, and had, particularly on the journey, been considerable, almost wholly ceased towards the end of his stay at Eaux-bonnes, and he was so well that he was able to remain for a fortnight at the camp at Chalons, being during that time daily, and sometimes even all day, on horseback; so soon, however, as he recommenced railway travelling, the shaking lateral motion again brought on slight hæmoptysis.

After a course of the whey-cure in Interlaken he returned home, and was now particularly well; he had only a few slight attacks of hæmoptysis when he stooped much, until the 14th of March 1868, when, after having been long occupied in laborious writing, violent hæmoptysis once more came on, though less copiously than on the first occasion. In July he went once more to Eaux-bonnes; the hæmoptysis continued, being more severe while he was on the journey, but it again nearly disappeared towards the end of a three weeks' course of treatment. He then made another trial of the whey-cure at Interlaken, whence he returned home. An ulcer produced by moxa, which had been kept in a state of copious suppuration, was not closed until November. From that time he has been well, easily bears long marches, and takes part without inconvenience in field exercises; he is in good condition, his general health is quite satisfactory; only once did the hæmoptysis recur, namely, on the 16th of January 1869, when, on turning in bed, he suddenly brought up about three tablespoonfuls of clear blood. He has occasionally the usual cough, with which he brings up a single greenish yellow sputum; he states that he has a peculiar feeling of oppression in the region of the wound, which, as it were, compels

him to cough, and which is relieved when he has expectorated. A recent stethoscopic examination yielded the same result as before.

There can scarcely be any doubt, that in this case we had to deal with a penetrating gunshot wound, as was diagnosed immediately after the injury by an experienced military surgeon. It is true that there were wanting not only the absolutely certain signs —emphysema, pneumothorax, and the escape of air through the wound—but also the signs of an accumulation in the cavity of the pleura (hæmothorax, pleuritis); and this total absence of these almost constant symptoms can be explained only by pre-existing firm adhesions, of which we have, in the history of the case, a satisfactory reason in a preceding pneumonia. Of the ordinary symptoms we had properly only one, but in a diagnostic point of view a very important one, namely, the hæmoptysis; it was unusually violent and persistent, which is explained by the fact, that the lung, on account of the firm adhesions, which did not allow it to yield before the projectile, had been struck much more seriously than might have been expected from the size of the external wound, and from the absence of pneumothorax and hæmothorax, the importance of which in arresting the hæmorrhage has been above spoken of. Whether there may possibly have been a circumscribed pneumonia, which is said to have had a duration of only from eight to ten days, could not, when I saw the patient, be decided.[1]

Taking it, therefore, for granted that the ball perforated the lung, the next question is, what share this lesion has in the secondary hæmoptyses. That the gunshot wound stands in a definite and direct relation to the hæmoptysis is undoubted. For the possibility, which at first certainly existed, that the hæmoptysis might be due to pulmonary phthisis developed after the wound, as is stated by certain writers, must now, more than five years after the primary, and almost two and a half years after the first secondary hæmoptysis, according to the results of the physical examination, and the patient's otherwise perfectly good general health, be totally discarded. But, besides, the hæmoptysis has something so peculiar in it, which is not ordinarily observed, and which decidedly indicates a direct relation to the wound, as the lancinating pain in the region of the injury, which usually precedes the hæmorrhage, the occurrence of the bleeding when the patient lies on his left side, or makes certain violent movements, as in stooping—a circumstance which is so constant that he, unfortunately, has it, so to speak, in his power to produce hæmoptysis at will.

It is, however, much more difficult to give a satisfactory explanation of the circumstances under which these copious hæmoptyses occur, and it is only a more or less probable hypothesis which, after all, can be suggested, when every anatomical point in former examinations is wanting. A mere bullet-track through the lung, in an individual who survives the injury, is gradually filled by granu-

[1] Traité de Chirurgie d'Armée, par L. Legouest. Paris, 1863, p. 470.

lations, which, after a longer or shorter period, finally leave only a cicatricial streak; very often, however, as we shall subsequently see, a fistulous passage remains, which lasts for a long time, nay, even through the whole of life. That the track in the above case is not closed, at all events not completely, is indubitable; and the assumption appears to me to be most probable, that the bullet-track has remained open in a circumscribed spot, either by secondary osteophytic formation from the inside of the ribs—such a formation was distinctly observed on the outside—or by necrotic splinters of bone projecting into it; and, moreover, that the cavity so formed, being in open connexion with the bronchia, is partly filled by a spongy vascular granulation tissue. In the movements mentioned, especially stooping, in which a strong downward traction is exercised on the ribs, a more or less extensive hæmorrhage may, under such conditions, easily arise, purely mechanically, in consequence of the bony parts mentioned injuring the vascular granulation tissue. Under ordinary circumstances, only a purulent fluid is secreted from the walls of the cavity, filling it and giving the patient a sensation of pressure in the region of the wound; at last some of the contents escape into the afferent bronchia, causing the patient to cough and to bring up one, or at all events only a few purulent sputa, with simultaneous cessation of the feeling of pressure. Both from this, and from the negative result of the stethoscopic examination, it must be inferred that this cavity is only of small size.

It would hence appear that the prognosis in this case may be very favourable; it is to be expected that the cavity may gradually completely close, and the hæmorrhage therefore entirely cease.

As to the treatment, it was conducted on the ordinary principles; the visits to Eaux-bonnes seem to have had an unmistakably beneficial influence.

Case 2.—Private Peter Olsen, of the 6th Regiment, aged 23, received, on the 28th March 1864, at Dybböl, a gunshot wound in the back, the ball entering at the inner margin of the left scapula about one inch above the inferior angle, whence, fracturing the ribs it struck, it passed close under the skin to a little to the left of the spinous processes of the eleventh and twelfth dorsal vertebræ, where it remained, and was taken out the same day. During the first few days he had some hæmoptysis, and immediately after the injury very considerable external hæmorrhage. The day after he was admitted into the garrison hospital at Copenhagen. A violent empyema was now rapidly developed in the left pleura, with considerable discharge of pus from both openings in the back. This condition, in which the patient became greatly exhausted, continued, with varying intensity, until the spring of 1865; but from that time we succeeded, by continued drainage of the upper opening—the inferior, whence the ball was extracted,

had already closed—in gradually diminishing the discharge; but it was not until June 1866 that the patient could leave the hospital, and he had then, at the original opening of entrance, two fistulas, the one two or three millimètres in diameter, the other rather less. His general health was now, when he kept quiet, pretty good; he could, however, walk only very slowly, and all major movements of the left arm produced pain in the back, and sometimes cough.

In this state he continued, on the whole, until now, with the exception of the attacks of hæmoptysis, which he has had during the last two years, and the weakening effect naturally produced by them. The hæmoptyses, the first of which occurred on the 7th of February 1867, and the following, three in all, at intervals of about four months, had all about the same intensity, duration, and course. Violent movements of the left arm and walking rather quickly were, according to the patient's report, essentially co-operating causes of the occurrence of the hæmoptysis, as were cold and the increased cough produced thereby. The hæmorrhage commenced with the expectoration of some blood, then blood issued from the fistula, after which most blood came in this way, and only a little was coughed up. The discharge through the fistula and the hæmoptysis proper each time lasted about four days, and the quantity of blood lost is estimated at from 300 to 500 cubic centimètres (from about 10½ to about 17½ fluid ounces). During the last six months, in which the patient has kept the house, he has not had any hæmoptysis, but a considerable amount of pus continues, as it has done during the whole time, to be discharged from the fistula, occasionally mixed with small pieces of bone. When this discharge from the fistula perceptibly diminishes, the patient becomes short-breathed and gets a cough, which he otherwise usually has not, and while it continues, purulent expectoration is brought up. Into the fistula, in the immediate neighbourhood of which nothing abnormal can be discovered, and which passes in the direction of the highest point in the left axilla, an elastic bougie can be passed to a distance of eight centimètres, without apparently being much bent. On sounding, injecting, etc., no hæmoptysis ever occurred.

The sound on percussion is rather dull in the left infra-spinous and infra-scapular regions, otherwise it is normal everywhere, both on the left and on the right side. Respiration is everywhere vesicular; close to the fistula a faint metallic tinkling is occasionally audible.

The patient's general health is, as has been stated, good when he keeps quiet; but from the constant loss of substance by suppuration he is emaciated, and the caution with which he walks gives the impression that he is weaker than he really is. He cannot bear any exertion, and can occupy himself only with light manual labour.

For this, in many respects, interesting case, I am indebted to Hr. Chr. Krarup of Amager, under whose treatment the patient has latterly been. I shall, however, not at present touch upon

subjects to the discussion of which this case, considered as one of penetrating gunshot wound, might in many other respects give rise, but shall confine myself to the hæmoptysis and the points most closely connected with it. It occurred, as in the first case, very long, almost three years, after the injury, but was, in contrast thereto, much less frequent and less copious. While, in the former case, at least in the commencement, there might be doubt whether the hæmorrhage really proceeded from the wound; in the present instance, this was from the first indubitable, as the blood, for the most part, sought an exit through the fistula left after the original canal. By splinters of bone making their way into the lung, with secondary and persistent suppuration, the fistulous passage probably became much larger than should have been expected from the original direction and extent of the canal. The cavity thus formed is in connexion with the bronchia, which is evident on the one hand from the fact, that when the discharge from the fistula ceases, a purulent fluid is coughed up; on the other, from the circumstance that the patient has remarked, that in the unsuccessful attempt to effect closure of the fistula by stimulating injections, some of the injected fluids have, during the coughing so produced, reached his mouth, and also from his observation, that occasionally air blows out of the fistula. On the other hand, this communication cannot always exist, as in that case air should constantly pass in and out through the fistula, which it does not. The passage to the bronchia must, therefore, be assumed to be only narrow, as, moreover, the slightness of the hæmorrhage through the latter seems to indicate, so that it is easily plugged by the thick purulent secretion, and is opened afresh only on strong pressure, as by the injection of fluid through the fistula. That the cavity is only small is proved by its not admitting of the injection of more than two or three cubic centimètres of water, without producing violent cough.

The immediately exciting cause of the hæmorrhage seems in this instance also to be traumatic, especially violent movements of the arm, quick walking, and severe coughing, whereby strong pressure is exercised on the fistulous passage attached to the posterior wall of the thorax; possibly here also the retained spiculæ of bone play a part, but the bleeding granulations are evidently much less vascular and vulnerable in this than in the first case.

Case 3.—Observed by Dr F. Djörup, who kindly related it to me from memory. First-Lieutenant H. was, on the 23d April 1848, being then 33 years of age, in the retreat from Schleswig, wounded by a musket-ball, which entered at the inner edge of the inferior third of the right scapula, passed through the chest, and came out at the right side of the sternum. There was rather violent external hæmorrhage; the patient had not much pain except on movement of the right arm and on coughing, which was attended with copious hæmoptysis. During the following day he had smart

febrile symptoms, pain in the chest, with copious expectoration mixed with blood; the wounds discharged only a small quantity of bloody fluid, but subsequently a large quantity of pus flowed from them. The thoracic symptoms gradually diminished, and the wound in front was perfectly healed in the beginning of the month of June. Shortly afterwards he was admitted into Frederik's Hospital. There was then found at the lower margin of the right scapula a wound of healthy appearance, and of about the size of an eight-skilling piece, through which a probe could be passed to the length of twelve inches, and from which thick pus flowed out on pressure. The patient did not feel particular pain except on coughing, which produced lancinating pains through his chest. The cough was frequent, particularly in the morning, with copious puriform expectoration. He was pale, not emaciated; his general health was very good. The sound on percussion around the wound, especially inferiorly, was dull; in other respects it was everywhere natural, as was the respiration, which only in the parts mentioned was very feeble. Moist râles were heard over the whole of the right lung. The patient's health gradually improved; a number of splinters of bone was discharged through the wound, which, in the beginning of August, seemed to be healed, so that the patient left the hospital and went to the country.

The thoracic symptoms nevertheless continued, and the copious expectoration soon became chocolate-coloured, sometimes quite sanguineous. The posterior opening also gradually healed, but subsequently broke out again with precursory great difficulty of breathing, and, with the very copious purulent discharge, fragments of clothing and small pieces of lead were expelled. The track of the ball, indeed, closed again, but although his condition improved a little in the course of years, he still always suffered from some shortness of breathing, and from ordinary attacks of cough, with copious expectoration, and no year passed without the latter being at certain times more or less mixed with blood, usually presenting the appearance of grayish-red porridge. His general health, however, did not suffer; he even grew fat, and a striking change took place in the points of his fingers, these becoming completely clubbed, as is occasionally seen in congenital malformations of the heart. In October 1866 he died, with uræmic cerebral symptoms.

In this case we therefore had a chronic, suppurating, foul bullet-track, probably with secondary bronchiectasis. The secondary hæmoptysis was long-continued and frequent, but never very abundant or spontaneous. It seems to be most naturally explained by capillary ruptures in the bullet-track, produced by the violent fits of coughing.

These cases give me the opportunity of making a remark of a more general nature, namely, with respect to the relation of the hæmoptysis to pulmonary consumption. In my former essay I

have endeavoured to demonstrate the untenable nature of the doctrine recently adopted by Niemeyer respecting the development of pulmonary consumption from cheesy pneumonic infiltrations, produced by irritation of the blood in hæmoptysis retained in the bronchia and air-cells. One of Niemeyer's pupils, Bürger,[1] has, in support of this very theory, adduced the case of perforating gunshot wounds of the chest, and has especially appealed to Piorry, who as proof that "tubercles" may be developed as the result of hæmorrhages from the air-passages, adverts to the frequency of the occurrence of pulmonary tubercles after such wounds with hæmoptysis. In the three cases now before us, however, we have not, notwithstanding the long-continued and copious hæmorrhages, seen anything of the kind. If the occurrence of this secondary consumption after penetrating gunshot wounds of the chest should really be established, which our home experience does not bear out, it appears to me that it is more naturally explicable by the frequently persistent and exhausting suppuration from the bullet-track, with formation of fistula and pyopneumothorax, than by the primary hæmoptyses, which are seldom to any considerable amount; nor, according to my observations, do the secondary hæmoptyses seem to be attended with danger in this respect.

[1] Ueber das Verhältniss der Bronchial- und Lungenblutungen zur Lungenschwindsucht. Dissertat. v. Carl Bürger. Tübingen, 1864, p. 11.

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