

surgeon who recorded in the same connection that his patient had myopia and ophthalmia, the physician who noted as contiguous facts that his patient's tongue was coated and protruded to one side, would be derided as unscientific; but their errors would be venial indeed beside that of the alienist who looked on an hallucination as an affection of a special sense organ.

Schemes for investigating the bodily functions belong to the province of the physician, and, save in some departments bearing directly on the condition of the nervous processes, are plentiful and thorough. It remains to supply schemes, adequately fulfilling the requirements given above, for the investigation of mental conditions and of conduct. To supply these aids will be the object of a future paper.

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*On the Occurrence of Fat-emboli in the Acutely Excited.* BY  
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There occasionally occurs in lunatics who are labouring under acute maniacal excitement a more or less rapid loss of power. This may be followed by no further consequences; sometimes it marks the beginning of recovery, but it may rapidly end in death.

In many cases of the latter kind, acute inflammation of the lungs is found to be the cause of death; in others, infarcts occur due to emboli detached from peripheral thrombi. Septic infection, also, arising from gangrenous bed-sores, may be the cause of death, or it may be due to severe injuries which patients sustain in their excitement. But very frequently it remains obscure even after post-mortem examination. We are then wont to be satisfied by taking it for granted that death was due to the intensity of the disease, or—which comes to the same thing—to exhaustion.

It cannot be doubted that in many cases this is really the correct explanation of the fatal result. It is, however, quite certain also that the rather vague expression, "general exhaustion" sometimes serves as a cloak for our ignorance, and that under it are concealed several processes which might be more minutely defined.

As was shown in several cases during the latter years of my clinic, one of these processes is fat-emboli in the lungs—an appearance which, unrecognisable by the naked eye, is

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often overlooked, but can easily and certainly be determined by microscopic examination.

I begin with the communication of the most characteristic and interesting case of the kind. It has already been recorded by Dr. Flournoy in his paper on fat-emboli\* but it is of such decisive importance that I do not think it superfluous to repeat his detailed account of it.

1. Mrs. M., aged 28, was admitted on 19th May, 1878, to the psychiatric clinic. Until then quite well, she became acutely affected by the death of her husband three days previously. Menstruation, expected on that day, did not appear till the next (the day before her admission), and was accompanied by so much pain that the patient rolled on the floor to obtain relief. During the day nothing remarkable in regard to her mind was observed, but in the evening she went to a neighbour and begged leave to sleep with her as she was afraid to be at home. About 10 she became excited, seized her neighbour by the hair, ill-used her, shouted, jumped about the room, spoke in snatches about her household affairs as if she were busy with them, and about people who persecuted her and called to her. She again became violent and struggled to escape from the house. About two in the morning she quietened down and slept till five. She then relapsed into her former state, but the excitement was greater, and it became necessary to restrain her. As she became somewhat quieter about 9.30 she was removed to the clinic.

Here at first she gave some information about herself; said that something extraordinary had occurred in her head; that everything was confused; that she had an undefined feeling of fear, tightness of the chest and palpitation.

Soon after her admission she again became extremely excited, screamed, &c. She tried to cling to those around her, but with no intention of injuring them. After an injection of morphia she quietened down and slept till 2 p.m. At night the excitement returned, but we were more successful in fixing her attention, and she remembered all that had happened to her.

20th May. After an injection of morphia she slept till 4 a.m., but then became excited, destroyed her bed, and rolled on the floor. Vomited slightly. Yesterday menstruation was profuse, and is still present. Examination showed the genital organs to be normal. It should be noted also that the patient is very large and strongly built, and in good condition. On admission her face was slightly cyanotic; afterwards it became dark red through increasing excitement. Lips dry; tongue furred; pupils dilated, but sensitive. Even on admis-

\* Flournoy, Contribution à l'étude de l'embolie graisseuse. Thesis, Strassburg, 1878 (from the Pathological Institute of that city). It also contains a digest of the literature up to that date. Since then have appeared the work by Wiener (Arch. f. exper. Pathol. 1879) and the monograph by Scriba.

sion there were numerous bruises on the extremities, and they increased in number and size from day to day through the patient rolling on the floor and beating on the walls.

On 21st May her condition remained as before, only she appeared more cyanotic and weak. She was perfectly delirious, rolled and beat herself as before, and took no food. After a morphia injection she slept at night, but on the morning of the 22nd she appeared more exhausted, with very feeble pulse, whilst the wild excitement continued. The numerous bruises on the trunk and limbs have quite the appearance of *post-mortem* discoloration. At mid-day, whilst an attempt was being made to give her some milk through the œsophageal tube, she died.

The following are the results of a *post-mortem* examination by Prof. V. Recklinghausen. No decolorised coagula in the longitudinal sinus. Dura mater rather strongly injected. Considerable serum at the base. Brain weighs 1,275 grms. Pia mater of the vault œdematous, easily stript off, and easily torn. Slight redness of the apex of the convolutions. Ventricles small; ependyma markedly thickened: granular in fourth ventricle. Brain on section exsanguine, especially the gray substance. Nothing else remarkable. Arteries at base filled by coagula.

An unusually large, powerfully built person; fat, very muscular. Numerous small scratches on the trunk. An abrasion on right knee the size of a franc piece, dark red and dry.

On both hips marks, larger than a hand, of a dirty red colour, resembling *post-mortem* discoloration; these are the seat of sanguineous imbibition. A large number of similar, but smaller marks occur on the thighs, legs, and arms. More diffuse are similar discolorations; one on the back of the right hand and thumb, and another near the sternum and over the right side of thorax. The muscles dry and very dark. A large number of minute ecchymoses in the omentum, and in the mesentery, especially in its upper part. Intestines moderately injected. Peritoneum of posterior abdominal wall and of Douglas's pouch covered with ecchymoses. Lungs scarcely at all collapsed, not adherent, well distended with air, indeed somewhat emphysematous anteriorly. No condensation. Marked hyperæmia posteriorly, slight œdema. A small piece of straw in the throat. A bloody fluid, containing white masses (evidently milk) escapes from the larynx; it is present in the œsophagus, trachea and bronchi also. On both sides the heart contains firm coagula, decolourised on the right. Considerable quantity of blood in all. Walls very thick, especially the left. A few ecchymoses under the endocardium; no trace of any degeneration. Kidneys congested, cortical substance somewhat patchy; glomeruli prominent, large and pale, but of normal transparency. Nothing noteworthy in liver and stomach. Small ecchymoses in Peyer's patches. Masses of much hardened fœces in colon.

Microscopic examination gave the following results; the lungs contain an extraordinary number of fat-emboli, not only in vessels of .04

diameter, but even in some of  $\cdot 05$ . In the kidneys, parenchymatous nephritis; fatty degeneration of the epithelium of the tubuli. No emboli in glomeruli. No emboli in liver and heart. A few emboli of the very small vessels of the pia mater.

It can scarcely be doubted that in this case the almost complete blocking of the majority of the smaller pulmonary vessels was the cause of death. The exhaustion and collapse which appeared during the last two days of her life, in a woman till then strong and robust, may be partly attributed to the intense excitement which was present; but it is more probable that they were due to the increasing obstruction of the pulmonary vessels, in consequence of which the left ventricle was deprived of its blood.

As to the source of the fat which was found in the pulmonary arteries, it can only be sought in the adipose tissue, which became so extensively disorganised through self-inflicted bruising by a very fat and muscular patient. As injuries of the bones were completely absent, there only remains a possibility that in the bruised spots of the skin fat was reabsorbed and conveyed to the pulmonary vessels.

This case is of extreme interest, not only from a general pathological point of view—through the unusual origin of the fat emboli—but especially from a practical psychological one. On the former point I will first of all say a few words. That fat-emboli can occur through absorption of subcutaneous fat has hitherto only been proved in those cases in which gangrene or ichorous destruction of the structure has occurred. Here, on the other hand, we have simply a crushing of the fat by a mechanical force. Flournoy, who first described the case, has succeeded in finding only one analogous to it in recent literature, one by Dr. Fitz, of Boston,\* in which undoubtedly a purely mechanical injury of the subcutaneous adipose tissue led to re-absorption.

A man, who had sustained a dislocation of the thigh through being run over, died about 11 hours afterwards. Whilst in the hospital his pulse was weak, he had a rigor and became cyanotic. At the post-mortem examination the subcutaneous and intermuscular structures about the hip were extensively infiltrated with blood; the lymphatics surrounding the iliac artery contained blood, and the neighbouring glands were also blood-coloured. In numerous places the pulmonary vessels were filled with fat.

During the past year, however, an observation by Clouston

\* Boston Med. and Surg. Jour., 30th May, 1878.

has been published,\* which at first-look appears to present many analogies to those already given:—

The patient was an epileptic, æt. 40, who had a fit about once a week; was occasionally morbidly excited, threatened violence, was religiously deluded, and suffered from hallucinations of sight. Two months before his death he had a series of fits—for two days about two in the hour. He was quite comatose; on the second day he was much exhausted, and seemed likely to die. After he recovered from them, he remained very weak, and had swollen feet. No albumen. About four days before death he had a maniacal paroxysm; then fits came on one after another, accompanied by complete coma after the first few hours. Between the general convulsions he had local convulsions, affecting his face and arms. Died comatose.

Section:—Brain intensely congested, especially in the region of the pons and 4th ventricle. There were in some of the veins of the pia mater fibrous organised white bodies, in addition to the ordinary white clot. There was extensive fatty degeneration of the liver, kidneys, and muscular fibres of the heart. The bones were brittle; one of the ribs could easily be cut through. The cancellated tissue of ribs was very open, and filled with a grumous fluid. On microscopic examination many capillaries of the lungs were found to be plugged with fatty emboli, whilst in the pia mater many of the small vessels were filled with a substance which, like fat, was blackened by the action of perosmic acid.

On this Clouston remarks:—“This I believe, is a condition which has never been described in the human subject in epilepsy, or any kind of insanity.” This, however, requires correction, as the case observed by me was published by Flournoy in 1878. It is open to question if the same cause of fat-emboli was present in both cases. It cannot be doubted that in Clouston’s case the conditions for the formation of extensive bruises were present, but in his short account he makes no mention of them. At any rate there is the possibility of the fat-emboli having had their origin in the peculiar condition of the bones. In connection therewith I remember a series of cases, published by Flournoy, in which he found fat emboli in the lungs along with changes in the marrow, especially in old people suffering from marasmus. The spongy structure had largely disappeared, and the bone-cavities were filled with an almost fluid, deep red mass, in which, under the microscope, only very small fat cells and very numerous red blood corpuscles were present. Flournoy believed that through the hyperæmia of the

\* “Journ. of Ment. Science,” July, 1879, p. 219.

marrow, compression and destruction of the fat cells and reabsorption of the fat occurred in the much dilated vessels. In the same way the absorption of fat could have occurred in Clouston's case. But as in it the information is wanting as to the existence or not of hyperæmia of the marrow, it must remain uncertain whether the fat found in the lungs was derived from it or from the subcutaneous tissue, or perhaps from both.

Into the controversy as to the manner in which fat in the subcutaneous tissue is taken up by the circulation, I will not go further. From the experiments of Wiener, it is evident that if fluid fat be carefully injected beneath the skin, a slight degree of embolism is certainly produced. It is also taken up by the lymphatics. A more extensive and rapid absorption of the fat, expressed from the fat-cells, apparently occurs, if numerous vessels are torn, as is the case in extensive bruising. That Halm\* has not succeeded in producing fat-emboli in dogs through mechanical destruction of the subcutaneous tissue, proves nothing in opposition to the above positive results in men. Apparently these results only occur when the adipose tissue is largely developed, and the injured portions are subject to a certain but not too great degree of tension; as either the *vis a tergo* is wanting, or the torn vessels are occluded, and thus the absorption prevented.

These cases are specially interesting in settling the question whether they are quite exceptional, or if the appearance described is of frequent occurrence, but has until now escaped attention. I wish through my communication to suggest that in cases with a course similar to those described—and these are really not of such unusual occurrence—the microscopic examination of the lungs for fat emboli had not been omitted. In the meantime I may record some experiences from the last two years, which may assist in deciding the question.

2. On 21st October, 1879, a brakeman, æt. 37, was admitted under my care. A year ago he had his first epileptic attack; since then he has gradually become absent-minded, and is now a typical case of paralytic dementia. Soon after admission his incoherence and excitement gradually increased, especially at night, so that it was necessary to seclude him. In consequence of his helplessness he frequently fell down, and knocked himself against the wall, bed, &c., so that he

\* Halm, Beiträge z. Lehre v. d. Fettembolie, München, 1876.

soon had a number of bruises. On 1st November he became fevered, and there was a commencing bed sore over the sacrum. On 3rd November he had an epileptic attack, after which, though he recovered consciousness, he was more confused and feeble than before. The bed sore spread rapidly, and by the 5th there were large cavities. On the same day he became completely collapsed, and died in the afternoon.

At the examination, made by Prof. V. Recklinghausen, the pia mater was found very much thickened, and adherent to the gray matter. Marked unevenness of the surface of the latter. Dilatation of the ventricles and thickening of the ependyma. Slight change of colour in the posterior columns of the cord. Slight icteric tint of skin. Bruises on the extremities, especially the lower. Gangrene of the great toes. Scabs on the edge of both shins. Extravasations on scalp, especially anteriorly. Deep bed sore on sacrum with emphysema, which extends as far as the right thigh. In heart, firm clots not decolourised, and without fat. Slight roughness of aortic valves. Lungs greatly distended, but not emphysematous. Left slightly, right very oedematous. An old cicatrix in left apex. No infarction and no ecchymosis. Spleen enlarged; kidneys congested. Nothing of importance in other organs. Microscopic examination showed decided, but not very marked fat-emboli in lungs.

In this case the fat-emboli were not sufficient to account for the death of the patient; they can at most only be considered as accessory. Of greater importance are doubtless the extreme exhaustion and the septic infection due to the bed sore. The circumstances are somewhat different in the following case:—

S. N. N., æt. 35, artillery sergeant, was admitted to my clinic on 27th May, 1880. Eight years before he suffered from a syphilitic affection, which had reappeared several times during recent years, and for which he had repeatedly undergone specific treatment. He married in the meantime, and his child, now three years old, is still healthy. He has complained since last summer of a furry feeling and pains in the feet and difficulty in walking. At the same time there were loss of the tendon reflex, decrease of sensibility, and unsteadiness on closing the eyes. He improved under the use of pills of the proto-iodide, and in winter he considered himself cured, but he was extremely irritable, and prone to outbursts of rage and other excesses. Slight difficulty in speech was also noticed. Since last Easter his excitement has increased, and he has also given expression to exalted ideas, though he still attended to his work. The day before his admission he began to preach from the balcony of his house, bragged about his services to the country, wished to send his cigar-ends to the emperor, &c., &c., became completely maniacal when an attempt was made to remove him. After a prolonged

struggle he was overpowered and brought to the hospital, bound hand and foot. Here, freed from his bonds, he continued excited, was very violent to his neighbours, so that it was necessary to seclude him, when he knocked himself about a good deal against the walls of his room. In three days calmness and exhaustion appeared. He was extremely hoarse and very weak and remained in bed. It was possible to gain his attention, and he was conscious of his illness. Phlegmonous swellings developed on both thighs, and they continued to enlarge in spite of numerous incisions and antiseptic treatment. Bruises which existed on hand and forearms on admission afterwards became the seat of phlegmonous inflammation, resulting in deep sloughs and emphysema. A bedsore formed over the sacrum.

After a remission of several days his mental condition became worse. Although he could not get out of bed, he was quite delirious, spoke incessantly in a hoarse voice, and struck and spat at those around him. There was frequently fibrillar twitchings in the muscles, and during the last days high fever. He died on 12th June, after having been several times markedly collapsed.

The following are the results of the examination made by Prof. V. Recklinghausen :—

Cord much softened, especially in the gray substance, which showed red discoloration in patches. In the lumbar region the posterior columns somewhat transparent. Skull and dura mater much thickened, but nowhere adherent. No changes in the arteries. Brain weighs 1,460 grms. On section, numerous red patches due to capillary hyperæmia, but no other change. Ventricles somewhat large: ependyma granular. Irregular deficiencies of structure along the edge of the tongue. Mucous membrane of the throat congested, but without cicatrices. A deficiency of structure on left vocal cord, communicating with perichondrial abscess in neighbourhood of arytenoid cartilage. Lungs congested and very œdematous, but nowhere infarctions or infiltrations. Heart normal. Nothing calling for notice in abdominal organs. Several cicatrices on the corona glandis. No other changes on the genitals. There was no evidence to support the reasonable supposition formed whilst he was alive, that the whole of the morbid phenomena were dependent on syphilis. Deep sloughing on sacrum and both legs, especially the left, in which the tibia is exposed. On both forearms discolorations of the skin, and openings which lead to cavities filled with fœtid fluid. A rupture of rectus abdominis; at that spot a cavity filled with fluid and gas. Numerous fat-emboli found on microscopic examination of the lungs.

In this case also extensive sloughing occurred, which, undoubtedly reduced the strength of the patient, and was, perhaps, alone sufficient to cause death. Yet the fat-emboli in the lungs were so numerous that, in the opinion of



Prof. V. Recklinghausen, they must be considered amongst the causes of death.

The last two cases evidently cannot be classed with the first without reserve. Whilst in it the extensive formation of fat-emboli was due to the recent destruction of the subcutaneous fat without further development of inflammation; in the others, whilst there was extensive suppuration and sloughing of the subcutaneous tissue, the fat-emboli were not so numerous, and death occurred larger after their first appearance. That such suppuration of the subcutaneous cellular tissue can give rise to fat-emboli has long been known and could easily be illustrated by numerous quotations. For our purpose, however, it is only necessary to prove that such results may follow extensive contusions, and suppuration due to bedsores; and I do not doubt that such a condition of things will be found comparatively frequent when once attention is directed to them. Relative to their connection with bedsores I can refer to another case from my clinic, which has already appeared in the paper by Flournoy (Obs. xx.). It was that of a quiet paralytic, in whom, on admission, the knee joints were contracted, and afterwards sloughs developed on all the prominent parts of the lower extremities. The case is, however, not quite conclusive, in so far that the already mentioned change in the spongy substance of the sternum was present, and this may have been the origin of the fat-emboli.

Leaving this last doubtful case also out of consideration, the two others, however, prove that suppurations due to extensive bruises can produce fat-emboli, and under certain circumstances cause death, just as the first cases showed similar results from bruising of the adipose tissue. The first combination will, perhaps, be found of frequent occurrence, the last rather seldom. For the latter the following conditions are required:—Abundant subcutaneous fat and severe mechanical injury of it. The continued restlessness and repeated knocks of the above-mentioned patient probably favoured, to an unusual degree, the destruction of the fat-cells and the absorption of the expressed fat. Bruising, to a less degree, appears, on the contrary, to be innocuous. A short time ago, in a case of delirium tremens, who died in an epileptic attack, and who had sustained numerous bruises in and before the fit, we found only slight traces of fat-emboli in the lungs.

Of course fat-emboli are only dangerous to life in those

cases in which they affect a considerable extent of lung tissue. When formed to a slight or even moderately-marked extent they may remain harmless, as is well known from numerous clinical and experimental observations. The emboli are only fatal when the greater part of the vessels in the lungs are rapidly obstructed, and thus the supply of blood to the left heart materially diminished.

If in consequence of other causes (exhaustion through continued excitement or marked disease of the brain) the movements of the heart are already weakened, then a slighter degree of fat-emboli may cause death.

In glancing at the result of this communication, I would like specially to warn against exaggeration in believing that death from fat-emboli is of great frequency amongst the acutely excited, and that every otherwise unexplained death must be attributed to this cause. As I have said, we require further observations before concluding on this point.

But we must no longer regard extensive bruises in such patients as unimportant, as these—without sloughing—can directly cause death. Any method to protect patients from this kind of self-injury is urgently required; but I must confess that I know of no one quite satisfactory. If patients are held by attendants, matters are only made worse. With restraint we are not much better off, as the patients in the jacket, and even when bound in bed, always have the opportunity of bruising themselves. I must, however, say that with such cases the least objectionable form of restraint is fastening in bed, and I have frequently regretted the omission to employ it.

Suitably arranged padded rooms would certainly afford the best protection. But a really satisfactory arrangement remains to be devised. Still, in my opinion, they should be in every asylum, and they would be found useful, even in their present condition, if employed in those very transient conditions in which the patient is in danger of blows and bruises from his own violence.

In conclusion I may make a few remarks as to the kind of circumstances in which the danger of extensive contusions and the consequent risk of death from fat-emboli are greatest, and as to the nosological position of these circumstances. As I will again emphasise, it is not a distinct disease, but only a symptom, which may occur incidentally in the majority of diseases; the symptom of delirium with excite-

ment highly developed. It is this symptom which has been most appropriately called acute delirium, as in its beginning and course it is almost always acute. As Mendel has remarked, it is not correct to consider this delirium as a special form of disease, differing from other mental affections and marked by a distinct anatomical basis.

The authors who have erroneously made this metaphysical distinction have confused cases of acute general paralysis, melancholia with excitement, and acute mania; and besides these, they occasionally place in the same category cases of primary insanity with intercurrent delirium, epileptic delirium, delirium of acute diseases, &c. But it is very remarkable that they make a distinction between this acute delirium and another entirely (pretended) different disease which they call mania transitoria. It is, indeed, hardly conceivable how such a distinction can have crept into medical literature.

If one reads the descriptions of these two diseases as given in various monographs, and in recent text-books on mental disorders, we find in both intense excitement, acute from the very beginning, pronounced delirium and hallucinations, either the maniacal or melancholic type prevailing, occasional loss of consciousness with or without convulsions, marked disturbance of the circulation, congestion of the head, occasionally fever. If we look for any, even an apparent difference we find—1. That mania transitoria usually ends favourably, acute delirium unfavourably. 2. That the duration of mania transitoria is shorter than acute delirium. Both distinctions are quite fallacious.

As to the difference in duration, the opinion of Krafft-Ebing is generally quoted\* that the average duration of attacks of mania transitoria is from two to six hours. But he reports cases, observed by himself and others, in which the attack lasted more than 24 hours, sometimes with remissions, but occasionally continuously. Cases of several days' duration are moreover abundant in literature, and must have been observed by every asylum physician. Where then is the line separating it from acute delirium, which may run its course in a few days, but generally extends to a few weeks?

But the difficulty disappears very simply if we say: Conditions of intense delirium with excitement, whether of

\* Die Lehre von d. Mania transit. Erlangen, 1865, p. 28.

maniacal or melancholic character, are dangerous to life according to their duration.\*

Little as we know at present of the anatomical basis of these conditions, still we know that they indicate a very serious disturbance of the functions of the brain. When transient or occurring in persons of unusual vigor, they may pass off without any result, and be dangerous neither to mental soundness nor to life. They may thus occur quite alone as transient mania or melancholia, or as an intercurrent phenomenon with all kinds of mental disorders. By no means unfrequently they occur at the beginning of simple mania of several months' duration, thus easily causing an error in prognosis, until we are guided to a correct conclusion by some abatement in the delirium and excitement, by the occurrence of connected ideas (*ideenflucht*), and more rationally ordered muscular movements. The same is observed at the beginning of acute melancholia.

But when of longer duration and the patient less able to combat them, these conditions lead either to permanent destruction of the mental powers or directly threaten life. Death may occur in several ways; occasionally through exhaustion, especially when the nutrition of the heart is impaired; and now and then it occurs through inflammatory diseases of the lungs. Very frequently it is directly or indirectly the consequence of phlegmonous abscesses and sloughs due to the patient's violence. The origin and unfavourable course of the latter processes may further occasionally be assisted by disturbance of the circulation, and possibly also by trophic derangements, which are consequent on serious disease of the brain. But in many cases—and here I return to *the* point to be proved in my paper—the unfavourable course of apparently unimportant affections in some cases is to be attributed solely to fat-emboli in the lungs. The evil does not lie in the brain disease itself, but in the accidental complication. Perhaps, also, many of the transient attacks of faintness and collapse, observed occasionally in short attacks of delirium, may be attributed to the same source.

\* Since sending this paper to the printer, I have seen, for the first time, the recent article by Jehn, "On acute [transitory] mania and acute maniacal delirium" (*Deutsche med. Wochens.* 1880. No. 27). He contributes nothing new in support of the, to me, objectionable differentiation of these diseases—"the most innocent and most dangerous of mental diseases," as he expresses it.