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CASE
OF
HYPERTROPHY OF THE SPLEEN AND LIVER,
WHICH DEATH TOOK PLACE FROM SUPPURATION OF
THE BLOOD.

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(*From the Edin. Med. and Surg. Journal, No. 165.*)

The very remarkable case about to be related derives unusual interest from its similitude in almost every respect to the one just recorded by Dr Craigie.* Although the most evident lesion during life was enlargement of the spleen, I agree with him in thinking that the immediate cause of death was owing to the presence of purulent matter in the blood, notwithstanding the absence of any recent inflammation, or collection of pus in the tissues.

Numerous authors have asserted † that they have found purulent matter in the blood, independent of any local inflammation, or abscess from which it could have been derived. Hitherto all such statements have been very vague, because no measures were taken to ascertain whether this purulent-looking matter was really pus. We frequently meet with animal fluids, which, to the naked eye, resemble pus, although, when more minutely examined, they are found deficient in the peculiar cells that characterize that morbid product. Gulliver more especially has pointed out that the colourless coagula which form in the heart and large vessels break down mechanically or by maceration into a pulpy mass or fluid.

* See Dr Craigie's case in same Number of Journal from which this is extracted

† Bichat, Ribes, Gendrin, Andral, Bouillaud, Carswell, &c. &c.

The purulent collections in the heart and blood-vessels described by Gendin and Andral are considered by him to be fibrin softened in this manner. Again, we know that the blood in a state of health contains a number of colourless corpuscles, which closely resemble those of pus. Hence has latterly arisen the opinion, that the isolated pus corpuscles described by some authors were only the normal structures of the blood, and that, where after death large intra-vascular collections of purulent-looking matter were discovered, they were caused by softened colourless coagula.

In the present state of our knowledge, then, as regards this subject, the following case seems to me particularly valuable, as it will serve to demonstrate the existence of true pus, formed universally within the vascular system, independent of any local purulent collection from which it could be derived. The individual entered the clinical ward of the Infirmary under Dr Christison, to whom I am indebted for the history of the case. The *post mortem* examination, and microscopic investigation were conducted with the greatest care by myself, and my assistant Mr Morris.

John Menteith, aged 28, a slater, married, admitted into the clinical ward of the Royal Infirmary, February 27, 1845. He is of dark complexion, usually healthy and temperate; states that twenty months ago he was affected with great listlessness on exertion, which has continued to this time. In June last he noticed a tumour in the left side of the abdomen, which has gradually increased in size till four months since, when it became stationary.

It was never painful till last week, after the application of three blisters to it; since then several other small tumours have appeared in his neck, axillæ, and groins, at first attended with a sharp pain, which has now, however, disappeared from all of them. Before he noticed the tumour he had frequently vomiting in the morning. The bowels are usually constipated, appetite good, is not subject to indigestion, has had no vomiting since he noticed the tumour. Has used chiefly purgative medicines, especially croton oil, has employed friction with a liniment, and had the tumour blistered.

At present there appears a large tumour, extending from the ribs to the groin, and from the spinal column to the umbilicus, lying on the left side. It is painful on pressure near its upper part only. Percussion is dull over the tumour; pulse 90; states that for three months past he has not lost in strength. There is slight œdema. To have two pills of iodide of iron morning and evening.

March 1. Urine of yesterday somewhat turbid when just passed, natural in colour, acid to litmus; sp. gr. 1013. Sediment presents cubic crystals under the microscope, disappears almost

entirely on the addition of *aqua potassæ*, but is unaffected by nitric acid. The filtered urine is not affected by *aqua potassæ*, and yields only a slight white haze when boiled.

March 3. Legs œdematous, ordered to be bandaged with flannel bandages.

March 9. Œdema of legs increased.

Postasæ Carbonatis, ℥j. ; *Spiritus Ætheris Nitrici*, ℥iv. ;
Aquæ Menthæ, ℥iij. ; *Aquæ fontis*, ℥ij. *Sumat unciam*
ter in dies.

March 10. Tormina and diarrhœa increased; urine not increased.

Habt. Haustus ex Olei Ricini, ℥ss. *statim* ; *et exactis quatuor horis*, *Opii* gr. ii.

March 12. To have steak diet.

March 13. Attacked this morning with heat of skin; thirst; pulse, 110, full, very compressible. Had some diarrhœa yesterday; none this morning since an opium pill. Urine, 100 ounces.

Omittantur medicamenta. Sumat statim Pulveris Ipecacuanhæ et Opii gr. x., *et repetatur singulis semihoris ad tertiam vicem.*

March 14. No sweating from the powders; diarrhœa still rather troublesome; pulse, 100, softer; tongue dry and brown; febrile expression of countenance resembling that of typhus.

℞ *Aquæ Acetatis Ammoniacæ*, ℥vi. ; *Solutionis Morphicæ*, ℥i. ;
Aquæ fontis, ℥iij. ; *Syrupi*, ℥j. *Sumat unciam quartâ quâque horâ.*

Habt. Decoctum Hordei pro potu.

March 15. Died suddenly in the morning.

Sectio Cadaveris. March 19th, (four days after death.)—Externally the body presented a considerable prominence of the ensiform cartilage and false ribs on both sides. The abdomen was contracted; considerable dulness on percussion on left side, which had previously been marked out by a line formed with nitrate of silver.

No ascites nor œdema of the limbs.

Blood.—The blood throughout the body much changed. In the right cavities of the heart, pulmonary artery, *venæ cavæ*, *vena azygos*, external and internal iliac veins, and many of the smaller veins leading into them, it was firmly coagulated, and formed a mould of their size and form internally. In the cavities of the heart and *vena cava* the blood when removed was seen to have separated into a red or inferior, and a yellow or superior portion. The red portion was of a brick-red colour; it did not present the dark purple smooth and glossy appearance of a healthy coagulum, but was dull and somewhat granular on section, and when

squeezed readily broke down into a grumous pulp. The yellow portion was of a light yellow colour, opaque and dull, in no way resembling the gelatinous appearance of a healthy decolorized clot. When squeezed out of the veins as was sometimes accidentally done where they were divided, it resembled thick creamy pus. In some portions of the veins the clot was wholly formed of red coagulum. In others it was divided into red and yellow. In a few places the yellow formed only a streak or superficial layer upon the red, or covered the latter with spots of various sizes. Whether this coagulum existed in all the veins could only have been ascertained by a complete dissection of the body. It was seen, however, that the femoral veins, after passing under Poupart's ligament, were empty and perfectly healthy as far down as the Sartorius muscle.

The external and internal iliac veins, as well as the pelvic veins were full and distended. The azygos, both axillary and jugular, veins, were full, also the longitudinal, the lateral, and other sinuses at the base of the cranium and veins ramifying on the surface of the brain.

In this last situation some of the veins appeared as if full of pus, whilst others were gorged with a dark coagulum. In the aorta and external arteries were a few small clots resembling those found in the veins. These vessels, however, were comparatively empty. The basilar artery at the base of the brain was distended with a yellow clot.

Vessels.—The arteries and veins themselves were perfectly healthy. Although carefully looked for, in no place could thickening or increased vascularity be observed. Nowhere was the clot adherent to the vessels, but, on the contrary, readily slipped out when an accidental puncture was made in them.

Head.—On removing the *dura mater*, the veins which empty themselves into the longitudinal sinus were considerably engorged, especially posteriorly. Some were filled with the red and others with the yellow clot previously described. Others again were half-filled with red and half with yellow coagulum, the passage of the one into the other being clearly perceived. Both hemispheres with the longitudinal sinus and *falx in situ* were removed by a section across the brain, as low down as the division of the cranium would permit. The brain was then discovered to be very soft uniformly,—a circumstance accounted for by the time which had elapsed since death.

The part removed was put aside in order to be preserved and hardened in spirit. The lateral ventricles were found healthy, contained no serum, and the choroid plexus was perfectly normal. At the base of the brain the basilar artery was seen distended with the yellow coagulum, as were also a few of the arteries, but to a very slight extent.

The substance of the brain itself was throughout healthy. All the sinuses at the base of the cranium gorged with the red coagulum.

Chest.—A few chronic adhesions united the pleuræ on both sides, which were easily torn through.

Both *lungs* were slightly engorged posteriorly and inferiorly. The anterior margin of the left lung emphysematous, but to no great extent. On section the yellow coagulum of the blood was observed to occupy all the ramifications of the pulmonary artery. In some places it was so consistent as to be drawn out, exhibiting an arborescent form; in others it was more soft, and exuded from the cut surface like thick pus.

Heart somewhat enlarged; weighed, when freed from coagulum, eleven and a-half ounces. Its texture was healthy; the valves normal. The right auricle much distended, and gorged with a firm coagulum, the upper third of which was found composed of the yellow, and the two inferior thirds of the red clot formerly described. The right ventricle and pulmonary artery were similarly distended; portions of the clot closely embraced the *columnæ carneæ*, but were in no place adherent. The coronary arteries and veins were normal.

Abdomen.—On the inferior surface of the diaphragm there existed a firm almost cartilaginous deposit about a line in thickness, of a white colour, oval form, two inches long, by one and a-half broad, with irregular margins, which were composed of several rounded tubercular bodies, the size of a small pea, and of a similar structure.

The *liver* enormously enlarged from simple hypertrophy. Its structure throughout healthy. Gall-bladder enlarged and distended, with a clear pale yellow bile. The whole weighed ten pounds twelve ounces.

The *spleen* also enormously enlarged from simple hypertrophy. It was of a spindle shape, largest in the centre, tapering towards the extremities. It weighed seven pounds twelve ounces. It measured in length fourteen inches; in breadth, at its widest part, seven inches; and in thickness, four and a-half inches. Towards its anterior surface was a yellow firm exudation, about an inch deep, and three inches long. The peritoneum, also covering a portion of its anterior surface, was thickened, opaque, and dense over a portion about the size of the hand.

Both *kidneys* healthy.

The *stomach* and *intestines* healthy throughout. About four inches from the anus the superior hæmorrhoidal veins were distended on both sides external to the rectum. They formed two chains of tumours about three inches long, consisting of, on the one side, three swellings as large as a walnut; on the other, of one swelling somewhat larger. They were filled with the red coagulum, broken down into a grumous mass.

The *lymphatic glands* were every where much enlarged. In the groin they formed a large cluster, some being nearly the size of a small hen's-egg, and several being that of a walnut. The axillary glands were similarly affected. The bronchial glands were not only enlarged, but of a dark purple colour, and in some places black from pigmentary deposit. The mesenteric glands were of a whitish colour, some as large as an almond nut. A cluster of these surrounded and pressed upon the *ductus communis choledochus*. The lumbar glands were of a greenish yellow colour, also enlarged, forming a chain on each side, and in front of the abdominal aorta, more especially at its bifurcation into the iliacs.

No collection of pus could be found in any of the tissues.

MICROSCOPIC EXAMINATION.—The yellow coagulum of the blood was composed of coagulated fibrin in filaments, intermixed with numerous pus corpuscles, which could be readily squeezed out from it when pressed between glasses. Where the yellow coagulum was unusually soft, the corpuscles were more numerous and the fibrin was broken down into a diffuent mass, partly molecular and granular, partly composed of the debris of the filaments broken into pieces of various lengths. The corpuscles varied in size from the $\frac{1}{80}$ th to the $\frac{1}{120}$ th of a mill. in diameter; they were round, their cell-wall granular, and presented all the appearance of pus corpuscles. That they really were such was proved by the action of water and of acetic acid, the former of which caused them to swell and lose their granular appearance, whilst the latter dissolved the cell-wall and caused a distinct nucleus to appear.

This nucleus was generally composed of one large granule about the $\frac{1}{200}$ th of a mill. in diameter; but here and there two or three smaller granules could be observed, as is seen in corpuscles of laudable purulent matter.

The red portion of the coagulum contained a large number of these pus corpuscles, mixed, however, with a multitude of normal yellow corpuscles.

The pus corpuscles above described were found in the blood throughout the system. They were seen in the veins and arteries ramifying on the brain, in the coronary veins, hæmorrhoidal tumours, and wherever the blood was examined. On stripping off a portion of the *pia mater*, and examining the capillary vessels of that membrane, all that were not too minute to contain them were found crowded with the same corpuscles. This fact was confirmed by Dr A. Thomson, to whom I sent a portion of the brain for that purpose.

The cartilaginous deposit on the inferior surface of the diaphragm was composed of dense fibrous tissue, in which numerous granules and molecules were observed.

The exudation in the spleen was composed of amorphous fibrin mixed with numerous molecules, granular and imperfect cells. These were intermingled with bundles of filamentous tissue.

The enlarged lumbar glands, on being pressed, exuded a fluid that was crowded with corpuscles; some resembling those of pus already alluded to; others oval, containing a distinct nucleus. Acetic acid produced the same changes in these as in the pus corpuscles found in the blood.

The ultimate texture of the muscles, brain, nerves, &c. were carefully examined and found normal.

Remarks.—The points connected with this case that require discussion are, 1st, the connection between the symptoms and morbid appearances; 2d, were the corpuscles contained in the blood really those of pus? and, 3d, if so, how were they produced?

1. The connection between the symptoms and morbid appearances does not appear very evident. The enormous size which the liver and spleen had attained caused no great inconvenience. There was only slight œdema of the legs, without ascites. The most important symptom in the case was the occurrence of fever on the 13th, which continued until his death. This was sudden and unexpected.

Reasoning from these facts, it is clear we cannot ascribe death to the lesion of the liver or spleen, or to the structural alterations found in the tissues. On the other hand, there are equal difficulties in ascribing it to the fever, for in this case it did not exist to any great extent, and was unattended by prostration of strength. Again, in cases of phlebitis and purulent absorption, when we know pus has entered into the circulation, the symptoms in some respects are different. In phlebitis there are a greater or less number of local symptoms which here were absent. In purulent absorption, in addition to local symptoms, we have a peculiar depressing form of fever, local pains, and often yellow skin.

In Dr Craigie's case, however, the fever was more marked and longer continued. Cephalalgia and delirium were present. Blood was extracted from the arm, but unfortunately its character is not stated, nor was it examined microscopically. Whether pus existed in the blood at that time, therefore, cannot be ascertained with certainty, but it is at least highly probable. When both cases are taken into consideration, I think there can be little doubt that pus in the blood was the cause of death, and that it produced the febrile symptoms.

It is important to remember that there was no phlebitis, abscess, or purulent collection to which the appearances within the vessels could be ascribed. In all cases of phlebitis there are changes in:

the vessels themselves, and the clot is more or less adherent to the vascular walls. Nothing of the kind could be detected in either of the two cases related, although in both, particular attention was paid to this point.

How far the hypertrophy of the liver and spleen may be connected with the coagulation of the blood, and the formation of pus, it is difficult to say. The remarkable similarity between the two cases would lead us to conjecture that in some way they stand in the relation of cause and effect. Whether the hypertrophy of these organs exercises a peculiar influence on the blood, or whether the change in that fluid be caused in connection with chronic diseases in general, as has been lately pointed out by M. Bouchut,* farther observations alone can determine.

2. The second point of inquiry is, were the corpuscles observed in the blood really those of pus? The only bodies with which they can be confounded are the colourless corpuscles of the blood itself, the corpuscles described by Gulliver as existing in softened fibrin, and those found in lymph.

With regard to the colourless corpuscles of the blood, we know of no instance where they existed in the amount, or ever presented the appearance described.

As regards softened fibrin Gulliver observes, "Besides its proneness to putrefaction, softened fibrine differs in some other chemical properties from pus; and the characteristic globules of the latter are either wanting in the former, or not in sufficient quantity to render the matter identical with pus. The mass of the softened fibrine, in short, is made up of a very minutely granular substance, frequently with some very irregular flaky particles,—the globules which it often, and indeed generally contains, forming but a small proportion to the other materials; whereas the globules of pus constitute the bulk of the particles visible by the microscope."† This description in no way applies to the present case; the bulk of the matter being undoubtedly formed by pus corpuscles. In other cases, however, it would appear that Gulliver has seen similar bodies very numerous in clots. Thus, in a clot from the portal vein of a woman, and in another from the heart of a man aged 31, who died of sphacelus and suppuration, they were in vast numbers.‡ On the addition of an acid, their nuclei were shown naked, mostly rather irregular in shape, generally nearly round, and not uncommonly oblong, as if extended by growth. He adds, these "corpuscles may be sometimes found together in great abundance in one part of a clot, when the most

* See *Memoire sur la Coagulation du sang Veineux dans les Cachexies et dans les Maladies Chroniques*, Nos. 16 et 17 *Gazette Medicale de Paris*, 1845. Translated in *Lond. Med. Gazette*, Nos. 916-918, 1845.

† Gerber's *Anat.* p. 29.

‡ *Idem.* p. 33.

diligent search is unable to detect them in another part not many lines removed; and many clots may be examined without finding any of the corpuscles.* From this description it is not very clear whether the latter corpuscles are identical with those seen in the case under discussion; but there occurring partially only here and there is a circumstance very different from the universal presence of these bodies throughout the capillaries, as seen by myself and Dr A. Thomson. To determine whether softened coagula assume the character and appearances observed in the clots of this case, I repeated the experiments of Mr Gulliver, and macerated portions of colourless clots found in the heart in inverted intestines and pieces of oil silk. I found his descriptions to be exact, but satisfied myself that the corpuscles of the artificially softened clot were widely different from those observed in the vessels of Monteith. This was strikingly apparent on adding acetic acid. Without figures it is not possible to demonstrate this perfectly, and circumstances have prevented my publishing these in the present Number of the Journal. They will be given, however, on some future occasion.

With respect to the corpuscles observed in plastic lymph (plastic corpuscles) they are easily distinguished by the phenomena observed on adding acids. They never present the peculiar nucleus of pus globules, although they otherwise much resemble those bodies. It is on this account that they have lately been denominated by Lebert "*pyoid*."

When, then, we take into consideration the existence of these corpuscles throughout the vascular system, their general size and appearance, and, above all, the changes they underwent on adding water and acetic acid, there can be little doubt that they were true pus globules.

3. The next question is, how were these corpuscles formed? Pus has long been considered as one, if not the most characteristic proofs of preceding acute inflammation. But in the case before us what part was recently inflamed? There was none. Piorry and others have spoken of an inflammation of the blood, a true hematitis; and certainly if we can imagine such a lesion, the present must be an instance of it. But it would require no laboured argument to show, that such a view is entirely opposed to all we know of the phenomena of inflammation. Without entering into this discussion, however, I shall assume it to have been satisfactorily demonstrated that we can form no idea of this process, without the occurrence of exudation from the blood-vessels, and that, consequently, the expression inflammation of the blood is an error in terms.† A moment's reflection will make it evident that all our ideas of, and facts connected with inflammation are asso-

* Gerber's Anat. p. 34.

† See the writer's Treatise on Inflammation, p. 52.

ciated with some local change in the economy. The constitutional disturbance connected with it we invariably ascribe to phlegmasia or fever, which pathologists hitherto have always separated. Unless, therefore, it could be shown that inflammation and fever were like processes, we must conclude that the alteration of the blood in this case was independent of inflammation properly so called.

But can we explain the production of pus independent of inflammation? We reply in the affirmative. The corpuscles of pus arise in a blastema formed of *liquor sanguinis*. This fluid, when exuded through the blood-vessels, does not thereby in itself undergo any change. If any circumstances, therefore, should arise by means of which it could be separated from the red corpuscles within the vessels, there is no reason why these pus cells should not be formed in it. Facts point out that this coagulation happens not unfrequently. Clots have been diagnosed in the heart and large vessels during life; cases are recorded where on puncturing veins in order to bleed, clots forming a mould of the vessel have been extracted.* M. Bouchut has lately pointed out the frequent coagulation of the blood in cachexias and chronic diseases, and we know that aneurismal dilatations and partial enlargements of arteries favour the formation of coagula and the stagnation of the blood. That, under such circumstances, pus corpuscles are occasionally formed, I have had numerous opportunities of satisfying myself.

In cases of phlebitis, where the vessel is obstructed by lymph, the clot presents different appearances under different circumstances. It is sometimes granular, at others contains molecular fibres resembling those in colourless coagula, and occasionally perfect pus corpuscles may be seen in it. I found these in the centre of a clot in the femoral veins of a man who died after amputation under Mr Syme. They were present also in the coagulum of the axillary vein in an individual who died under Dr Alison, with œdema of the right superior extremity. I have also found them in the centre of organised clots attached to the endocardium. In all these cases the peculiar granular nucleus was rendered apparent by the addition of acetic acid. Positive facts, therefore, indicate that pus can form in *liquor sanguinis* within the vessels independent of inflammation. In so doing it is produced according to the more general laws which govern the origin, growth, and decay of all cellular formations.

In the cases to which I have just alluded, the pus was prevented entering into the torrent of the circulation, either by unchanged portions of coagulable lymph, or by organised membranes which surrounded the clot. But in the case detailed, the transformation had taken place throughout the system, and the whole mass of

* Edin. Med. and Surg. Journ. vol. lii.

blood was affected. How is this to be explained? Of late years a doctrine has been introduced by the chemical school, which attributes fever to a process in animals similar to that of fermentation. By this process, denominated *zymosis*, (from ζυμωσις, to ferment,) an endeavour has been made to explain how, from the peculiar poison of small-pox, cow-pox, glanders, &c., similar diseases may be propagated. In short, a zymotic action is set up in the blood, whereby, from the contact of a small quantity of matter, the whole mass is affected. Many facts in pathology are in harmony with this theory, more especially all we know of the formation of pus in the blood, and its introduction by absorption or mechanical means. The experiments of Magendie, who injected pus into the veins, the phenomena of purulent absorptions after wounds and injuries, all indicate a general fever, dependent on the admixture of pus with the blood. Conclusive evidence is of course wanting to establish the theory alluded to, but the case under consideration appears to me capable of furnishing an important fact, which at some future period may serve to throw light upon the subject.

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