

**A treatise on varicose capillaries : as constituting the structure of carcinoma of the hepatic ducts, and developing the law and treatment of morbid growths, with an account of a new form of the pus globule / by Thomas Gordon Hake.**

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# VARICOSE CAPILLARIES.

## DR. HAKE'S STATEMENT.

[From the *London Medical Gazette* for Aug. 24, 1839.]

SIR,

IN the pursuit of knowledge there are two great principles to be observed: the first and most important being the dignity which invests the subject; the second, the personal interests of parties occupied in the pursuit. It is of the nature of the latter to affect us too closely; but in the controversy on which I am now entered, I trust I may ever be mindful of the former, whatever may be the character of the language used towards me by an opponent.

For my own part I place but little value on any discovery beyond its usefulness to the public, and am by no means ambitious of being called a discoverer for the mere sake of the title. It would even give me greater satisfaction to resign any fact that I might have arrived at, than be suspected of so low a vice as plagiarism. But when I put you in possession of the principal circumstances which have transpired in the matter at issue between a distinguished anatomist and myself, I am convinced you will agree with me that I could not have selected a more candid line of conduct than that which I have chosen.

About six weeks ago, I passed the latter part of an evening at the house of Mr. Kiernan, Mr. Powell being present. At a very late hour, and after we had examined a variety of objects, Mr. Kiernan, without comment, placed under the microscope a preparation of intestine, and invited Mr. Powell and myself to inspect it. I looked at it for some minutes, and during that time made various remarks, and, among others, one was to the effect that it contained what I had reason to think was varicose capillaries, which was certainly not met in the affirmative by Mr. Kiernan, but by the remark that one day I should know "all about it," and a repetition of the usual expression that he possessed "some extremely curious things," which he had never shown to any one. My curiosity being excited, I asked him to produce some of these curiosities, not at all ex-

pecting him to comply, and added, that he need not be afraid of my betraying him. He answered that he might, perhaps, one day. From that time to the present I have never seen one of his preparations.

Before stating to you the history of my humble researches, and the manner in which they were treated by Mr. Kiernan, to whom they were unreservedly submitted, I shall allude to the statements made by that gentleman in your journal, and examine the nature of his assertions.

As respects my having "repeatedly seen the greater number of his preparations illustrative of the anatomy of cancer," I can only say that I was once at that gentleman's house by invitation, when about half a dozen bottles were handed from his shelves for my inspection; that I have been present once or twice when the same scene has been repeated for the gratification of others; but that instead of these preparations, beautiful as they are, being illustrative of the anatomy of cancer, they contain nothing that may not be seen daily in the anatomical museums of the metropolis.

Mr. Kiernan asserts that "he had told me that he had other preparations illustrative of the mode of development of every description of growth;" that I "had repeatedly asked him to show me those preparations, and to communicate his views to me, promising him that I would not divulge any thing he might communicate to me."

Each of these sentences by itself is in a great degree true: Mr. Kiernan had told me that he possessed such preparations; I did ask him, but not repeatedly, to show me those preparations, and did say that I would not take any unfair advantage; but in the sentence which follows, viz., "that having no reason to doubt my honour, he complied with my request," the truth is entirely distorted; he asserts that in consequence of such request he produced his preparation, whereas the request was made by me subsequently to my seeing that preparation, as stated in my narrative. That





Mr. Kiernan "fully explained" to me that preparation of "varicose capillaries," or even used, or assented, to that term when employed by me; I unhesitatingly deny. The real fact is, that he was obstinately taciturn, and that whatever remarks were made came from me, with the exception of such as alluded to the beauty of the object, or the success of the injection.

The assertions which follow in Mr. Kiernan's letter relate to the subject of my researches; I will therefore pass over them for the present, and examine his letter to Mr. Powell, as well as the reply.

The only important part of that letter is contained in this sentence—"Dr. Hake now claims what I then showed him as a discovery of his own, and is about to make it public." In reply to this accusation, I beg distinctly to affirm that I never made such claim, or had such intention; but, on the contrary, at my last meeting with Mr. Kiernan, and before he wrote to Mr. Powell, I told him that I would publicly admit having seen his "preparation of intestine" before having entered on my present investigation.

Since then I have seen this disease in the intestine, but I fairly admit having first seen it in Mr. Kiernan's preparation: not that it was new to me, for I had previously seen aneurismal\* capillaries in the spleen.

Mr. Powell, in his reply to Mr. Kiernan's letter, says, "during the time (which was about an hour and a half) that Dr. Hake was examining it (the preparation) with the microscope, you pointed out several different parts to him, one of which you said was disease in its most incipient state. Dr. Hake said he could sit and look at it all night, and wondered you had not published it. He thought if you did not do so, it was likely some one would do it before you; and he added, he would be as silent as the grave."

I have already stated how long I looked at this preparation, which, although it showed no principle, but only a disease of capillaries in a particular structure, I admired as a microscopic object, but expressed no more admiration than I had done on examining the circulation in an aquatic plant, which I

had looked at for a much longer time that evening, and which Mr. Powell was absorbed in while Mr. Kiernan and myself were viewing the intestine. But Mr. Kiernan did not point out "different parts," one of which was illustrative of disease in its "incipient state," as Mr. Powell intends to imply: he only moved the preparation to show the parts which were injected. He said that he had preparations illustrative of the different stages of disease, which led me to remark that I wondered he did not publish them, for the Germans and French were hard at work, and, if there was any thing to be found out, they would succeed. To this Mr. Kiernan replied, that no one living could find out what he had done—it was utterly impossible: to which I rejoined, that the human mind was sufficiently alike in all men, and that one could observe as well as another, if he had but the industry to work; and these were the sentiments which I repeated to Mr. Powell while walking homewards in company with that optician.

Some weeks after this the diseased liver of a rabbit was sent to me by my poulterer, who had been in the habit of supplying me with various things for dissection. This liver was covered with what appeared abscesses. I examined the purulent matter which the cavities contained, and found that it consisted principally of ovate bodies—a form of pus which I had never before seen. Being satisfied, from this examination, that the disease was of more than usual interest, I took the liver to Mr. Kiernan, and stated to him that a disease had fallen under my observation, which probably would especially interest him, the liver being his subject, and requested him to accept it as an addition to his collection. He replied, that he was acquainted with the nature of the disease—he had seen it in the mouse and other animals—that, in fact, it consisted of abscesses. I continued, that I should like to show him the pus of these abscesses, as it presented remarkable characters. After a time we placed a small quantity of the fluid under the microscope. The first glance at it arrested his entire attention. "This," he said, "is wonderful; this is a discovery." I advise you by all means to work it out. I dare say, he said, I have some of it in my collection, but when I was collecting these fluids, I had not a microscope. You should call on the person

\* It may be suggested that I am indebted to Mr. Gerrard's letter for this expression; I therefore state that my work, in which this term occurs, was printed, and in the hands of Mr. Liston, before that letter appeared.



whether he has any more of the rabbits." I then proposed examining the fluid of the gall-bladder, which was done, and the same corpuscles were found in it, which led me to remark, that the disease must be in the ducts. To this he replied, that if I advanced that opinion, he should say that the abscesses had ulcerated into the ducts, and so effected a passage for the matter into the gall-bladder. On my leaving his house, Mr. Kiernan said that he thought the discovery a very fortunate one for me, and that he should call in the course of a few days, and see how I was getting on. He said the sub-editor of the *Lancet* was his friend, and he could insure me the means of publication in that journal.

On reaching my own house, I dissected the liver, and found that the disease was in the ducts. Two days afterwards I called on Mr. Kiernan, and, not finding him at home, wrote that I had some diseased ducts to shew him, which I was sure would interest him. He was prevented, however, from calling on me for several days, and when, at length, he paid me a visit, his first question was how I had got on with the disease. I informed him that what we had thought abscesses had proved to be enlarged ducts, and I shewed him my drawings, which represented their structure, while I explained to him that it consisted entirely of *varicose capillaries* (the very expression I had formerly used at his house,) which were derived from the portal vein and hepatic artery. Upon this he exclaimed, that he knew "all about it"—that, in fact, he "had done it all himself." I was surprised at such an assertion after he had declared on the occasion mentioned above that the disease was abscess. I reasoned with him to that effect, but he evaded my arguments, and said that I could not have understood the disease without having first seen his preparation of intestine. In this I differed with him, but assured him, that when I published the paper on which I was then engaged, I intended to state distinctly that he had shown me his preparation of intestine previous to my researches on the ducts. He replied, that "the less I said about him the better." I said that I did not choose to publish without mentioning that preparation; to which he replied, "If you do, I shall contradict you." He then said that he thought that in describing the structure of the

ducts I might very well confine myself to stating that I found them "highly vascular," as he had actually used the term "*varicose capillaries*" in his paper. Unwilling to deceive the public in so palpable a manner, in a matter of science, I declined acting on his suggestion.

I must not omit to allude to a statement which at this time Mr. Kiernan made respecting a gentleman who he said had seen all his preparations, and had threatened to divulge his secret. "I have shewn them," he said "to no one but him, and I do not believe that he could have understood them, not being a medical man."

The preceding is a faithful account of what has passed. With respect to the sentences which Mr. Kiernan has dexterously applied to his own purposes, viz.—"He has now the audacity to claim what I then communicated to him as a discovery of his own, founding his claim on the fact of his having 'worked during several hours for several days, and rediscovered' what he calls my 'secret'; admitting, however, that he first saw '*varicose capillaries*' at my house, and in my preparation; but stating that had I not shown them to him, he should have discovered them himself." Convinced, no doubt, by his laborious investigations, continued perseveringly 'during several hours for several days,' Dr. Hake assured me, my opinions were quite correct." The truth is as follows. When Mr. Kiernan suggested to me the use of the expression, "highly vascular," instead of a "plexus of *varicose capillaries* derived from the portal vein and hepatic artery," I said, "You should have accepted the disease when I offered it to you, but now I am interested in it, for I have worked incessantly at it for ten days." He then said he had used the words "*varicose capillaries*" in his paper, and that now my work would appear before his, as it was in so advanced a state, adding, that I had certainly "hit on the truth." To which I replied, that if *varicose capillaries* constituted the secret, of which he had so often spoken, his views were quite correct.

What Mr. Kiernan's secret really is, I do not know at this hour. If it consists in what he has published through Mr. Gerrard, the dispute at once ceases, for I confess I have never seen similar "looped and *varicose capillaries*." Mr. Kiernan, by "*varicose*,"



seems to imply "tied into knots:" my views are widely different. As respects the manner in which new vessels are formed, and the mode in which the blood enters them, these things have long ago been decided, and I believe published, by Dr. Todd, of Brighton.

Mr. Kiernan's last assertion, that "all Dr. Hake knows of varicose capillaries he has learned of me," I leave for others to decide on by an examination of my publication, wherein it will be seen how much my views differ from his on the subject of varix.

The gist of this controversy is briefly thus:—

1. Mr. Kiernan asserts that I desired him to exhibit to me his series of preparations, and that in consequence he showed and explained to me a preparation of varicose capillaries; whereas the truth is, I made that request after he had submitted to my inspection, without explanation, a preparation of intestine, and that that request was never complied with.

2. Mr. Kiernan asserts, in a letter to Mr. Powell, that I had claimed what he had shown me as a discovery of my own, and was about to make it public; whereas I had told Mr. Kiernan, previous to his letter to Mr. Powell, that I intended to give him publicly the full advantage of his preparation.

3. Mr. Kiernan asserts, that all I know of varicose capillaries I had learned of him; whereas the truth is, that I first saw varicose capillaries at Paris\*. I beheld them subsequently in Mr. Kiernan's preparation, and worked them fully out in carcinoma of the hepatic ducts in the rabbit; and moreover, that my views of varix and Mr. Kiernan's are totally at variance.

I have the honour to be, sir, with deep respect,

Your very obedient servant,

T. G. HAKE.

42, Gordon Square,  
August 21, 1839.

*Extract of a letter from Henry Lindo,  
Esq. of Paris, to Dr. Hake.*

"I immediately wrote to M. Monneret stating exactly the contents of your letter. This morning I have received his letter for you. I think you will find M. Monneret's letter suffi-

\* I possess four preparations of aneurism of the capillaries in tubercle of the spleen. These were made by me in Paris nearly a year ago, as MM. Andral, Monneret, D'Arcet, Dujardin, Lindo, and others, can bear testimony.

cient testimony that you had seen the dilatations. And, moreover, I wrote to M. Billot, who, if you remember, was present with me when you showed us some of your preparations; he does not remember your having shown us,—but that you mentioned the circumstance of having observed the dilatations of the arteries: and that is exactly the impression left on my mind.

"I should think that M. Monneret's letter is sufficiently clear to prove that you had observed the varicose state of the capillaries, and I have no doubt that you will find it so."

(COPY.)

19 Août 1839.

Mon cher confrère,—Je me rappelle fort bien qu'il y a quatre ou cinq mois, lors de votre séjour à Paris, vous avez bien voulu me rendre témoin de vos recherches microscopiques sur la structure de la rate; vous avez même dans ce but apporté chez Monsieur Andral et montré à ce professeur les diverses préparations anatomiques destinées à rendre évidentes la disposition des vaisseaux (artères et veines), leur mode de communication et la structure de ce que vous considériez comme les granules spléniques; vous m'avez parlé également à cette époque, de la dilatation des artères dans une rate tuberculée. Voilà ce que je puis affirmer, mais je ne puis dire si j'ai aperçu bien manifestement cette dilatation; mes souvenirs ne me servent pas en ce moment assez pour cela.

Je vous avais proposé à ce sujet de mettre dans les journaux de médecine français une note, dans laquelle vous auriez exposé succinctement les idées nouvelles que vous vous proposiez de développer plus tard; vous aviez même rédigé quelques lignes que vous m'avez montrées dans ce but. Il paraît, monsieur, que vous avez eu grand tort de ne pas suivre mon conseil, puisque l'on vous a contesté la priorité de quelques-unes de vos découvertes. Je le regrette vivement, d'autant plus que vous ne mettiez aucun mystère à publier le résultat de vos recherches.

Si mon témoignage peut vous être d quelque prix, je vous le donne avec le plus grand plaisir, et je profite de cette occasion pour vous renouveler mes souvenirs d'amitié.

DR. MONNERET,  
Agrégé à la Faculté de Médecine  
de Paris.

Rue Ste.-Opportune, No. 7.



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A TREATISE

ON

VARICOSE CAPILLARIES,

AS CONSTITUTING THE STRUCTURE OF

CARCINOMA OF THE HEPATIC DUCTS,

AND DEVELOPING THE

LAW AND TREATMENT OF MORBID GROWTHS.

WITH AN ACCOUNT OF

A NEW FORM OF THE PUS GLOBULE.

BY THOMAS GORDON HAKE, M.D.

LATE PHYSICIAN TO THE BRIGHTON DISPENSARY, ORPHAN ASYLUM, ETC.



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## ADVERTISEMENT.


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I FIRST saw varicose capillaries in tubercle of the spleen, given me, about ten months ago, at Paris, by M. Andral; I afterwards saw them in softening of the spleen, in which case they gave rise to hypertrophy of the entire organ, including the Malpighian bodies. In a preparation of intestine, which I was invited by Mr. Kiernan to inspect, I recognised the same state of the vessels, and communicated to Mr. Kiernan my opinion of its nature; but I had no suspicion of the full importance of this form of disease until recently, when I found that it was identical with carcinoma. The history of this discovery will be given in another place.

T. G. HAKE.

42, *Gordon Square, London,*  
*August 1839.*





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A T R E A T I S E

ON

V A R I C O S E C A P I L L A R I E S.

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THERE is a disease of the liver in the rabbit which consists of carcinomatous enlargement of the ducts, but manifests itself under the apparent form of small abscesses. This appearance is owing to dilatations of the ducts, which occur at regular intervals. These dilatations may be either few in number, or so numerous as to occupy the greater portion of the substance of the liver, and to be seen, through the peritoneum, to cover numerous points of its surface. (Plate I.)

I had been recently engaged in investigating the characters of pus, as developed under the various aspects of disease, and the first step of my inquiry into this affection of the ducts was to examine, by the aid of the microscope, the purulent fluid which they contained, although with no other expectation than of finding some known variety of the pus globule. This fluid, however, proved to be of a nature different to that of common matter; it consisted of ovate corpuscles, several times larger than the globules of ordinary pus. These corpuscles contained within their exterior oval capsule a central nucleus of a circular form, corresponding generally in size to the greatest transverse diameter of the exterior capsule, though varying from that to the entire length of the oval envelope. Within the central nucleus numerous molecules were imbedded, some



of greater and others of less size than those which may be exposed in the common pus globule by means of the solvent action of strong acetic acid. (See plate VI.)

A formal examination of the general characters of the disease and its relations led me to observe that the gall-bladder, cystic duct, and ductus communis choledochus, as well as the hepatic ducts, were distended with the fluid. From the common duct it passed freely into the duodenum, with the contents of which, as well as with those of the stomach and general intestines, it was mixed in considerable quantity. In two instances there was an obstruction to the passage of the fluid from the gall-bladder to the cystic duct. In one of these the gall-bladder was distended with a purulent, in the other with a greenish transparent fluid; but the ovate corpuscles were found within it in both cases.

The next step of the investigation was to ascertain the distribution of the vessels, and the means by which this matter was deposited in the ducts; the external surface of the enlarged portions of which appeared highly vascular, and of a deep red colour.

Having obtained another rabbit, I tied the aorta and portal vein so as to cut off all supply of blood to the liver. I then opened the hepatic vein. The liver, which was occupied by the disease to the fullest extent, was carefully injected on the following day, and with perfect success. The highly vascular surface of the ducts received the injection from both the hepatic artery and portal vein, but principally from the latter. The white fluid within the ducts was in some parts tinged with green, the colour employed to inject the portal vein; in others with the red injection from the artery. On opening different ducts and examining their inner surface, I found it to be the seat of a thick, irregular, morbid growth, which was deeply impregnated with the red and green injections, but in which no vessels were detectable by the naked eye, except the more considerable branches of the hepatic artery.

Having subjected both the outer or vaginal, as well as the inner surface of these highly-injected ducts, to microscopic observation, I found the former covered with an exceedingly minute plexus, derived from the portal vein, with branches of the artery crossing it. This plexus in many parts possessed the characters of healthy vessels; a fact of the highest interest in physiology, since it shows the exact manner in which the portal circulation is carried to the hepatic ducts; and being continued to the inner surface of the ducts, as will be presently shown, it explains the secretion of bile on the same principle as that



of other fluids, viz. by the distribution of vessels over a free surface. (Plates IV. and V.)

An examination of the inner surface of the ducts proved that the new growth consisted of a plexus of capillaries derived from the portal vein, interspersed with others from the hepatic artery. This plexus, however, instead of presenting a healthy form, was seen to consist of varicose vessels, in some parts dilated to an extraordinary degree and knotted, and in others contracted. Indeed, the entire structure consisted of a plexus of varicose capillary vessels.

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Dr. Carswell, in his elegant *Illustrations of the Elementary Forms of Disease*, has supplied a drawing of the affection of which this paper treats, and has the entire merit of having ascertained that it existed in the ducts, the extremities of which, he says, "are dilated into the form of pyriform sacs of various sizes. In these sacs, as well as in the biliary ducts, the tubercular matter was of the colour and consistence of cream, and was made to flow out at the cut extremity of the ductus communis choledochus, when pressure was applied either to the hepatic ducts or to their bulbous extremities. The pyriform sacs presented externally a smooth uniform surface; except in two or three instances, in which they were slightly lobulated. Internally, some of them had a cellular aspect, but the most of them were uniformly hollow. The fundus of several was connected with the substance of the liver by what appeared to be small blood-vessels."

These observations I have been able to confirm by examining the disease in its early stages. At first, simple dilatation of the duct, without thickening, takes place; the bile found within the duct at this period of the disease contains globules like those of the blood, but of three or four times their diameter, and occasionally with a molecule formed on their disc. In a more advanced stage the duct is thickened and pyriform at its egress from the glandular grains of the liver, and contains pus. This thickening of the duct represents the crude state of carcinoma; but as the disease advances, and the whole of the ducts become knotted, and indeed varicose (Plate II), the structure softens, and presents all the characters of medullary sarcoma. The cellular aspect which the disease presents is caused by shoots of vessels in the form of flocculi; and its ultimate softening by the tenuity of the vessels, which increases with their varicose growth.

It happens frequently that the outer surface of the enlarged ducts is coloured,



from the presence of congested vessels. By injection, this appearance is proved to be a plexus of capillaries from the portal vein. (Plate III.) These capillaries, not being varicose to the same extent as those within the duct, but often of a regular form and diameter, may be supposed to represent the distribution of the portal vein to the hepatic ducts in their healthy state. Branches of the artery also cross these ducts; but their plexiform distribution is reserved for the inner surface, where they blend, without anastomosing, with a similar structure of portal capillaries. (Plates IV. and V.)

The vessels which connect the enlarged ducts and the glandular grains of the liver are the minute ducts, which are distributed round those bodies. The walls of these capillary ducts, which do not participate in the disease, as well as those of the larger branches, receive injection from the portal vein.

The carcinomatous structure of the ducts is entirely vascular, and consists of a plexus of varicose capillary vessels, which extends in every direction, and not over the surface alone. In fact, the diseased vessels commencing from the external plexus anastomose, and proceed to the inner surface of the ducts, while, in the interstices which they leave between them, the pus is collected. The varicose state of the capillaries is almost coetaneous with their formation, the process of their growth being subject to pathogenic laws, if not their first formation. The new vessels do not shoot into an albuminous or any other deposit, as some have supposed; but proceed in the form of flocculi from a vascular base, become varicose, and again give out branches; and their increase alone constitutes the growth of carcinoma, and their different degrees of varix its progressive softening.

Such is the manner in which this morbid growth is developed within the ducts. Its structure is entirely vascular. If a transverse section of the duct be made, the plexus of varicose capillaries which forms its substance is seen to resemble a honeycomb; and the vessels are so minute, that only the more dilated ones are seen when magnified from twenty to thirty times linear.

Whatever may be the office of the hepatic arteries,—whether to supply the follicles of the ducts with blood for the secretion of mucus, or to separate the salts of the bile, both of which uses have been supposed,—they certainly are involved in the disease in question; for, though fewer in number than the veins, they are equally the seat of varix, or perhaps, more properly speaking, as respects arteries, of aneurism.

The efficient cause, then, of carcinoma, as existing in the hepatic ducts,



is to be found in universal varix of the veins and aneurism of the arteries, as affecting capillaries, and in the simple increase of vessels so affected. The application of this law of morbid developement to the study of disease will be found in the concluding portion of this essay.

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The purulent matter found within the diseased hepatic ducts of the rabbit, when examined by the assistance of the microscope, is seen to consist of two principal parts, a serous fluid and ovate corpuscles. The latter bodies bear the same relation to their containing fluid, as the blood or pus globules to their serum. They are semi-transparent: in form they resemble ova, but cannot be considered as such for various reasons. In ova there is a cohesion among the various parts, a continuity of organization: a state altogether contrary to this is seen in the ovate corpuscles, the great feature of which is their tendency to degrade from the normal form, and be resolved into their constituent parts, the relations between which are entirely physical. The substance of the ovate corpuscle is homogeneous, each of its parts being complete in itself, having a uniform structure, and united to the rest only through contiguity of substance and not by continuous organization. The membranous capsules (plate VI.) are constantly seen disengaged from their nuclei; the latter are found without their ovate capsules, while perfect in every other respect. Again, these circular nuclei, which differ in size, whether contained within or disengaged from their capsule, are sometimes partially or entirely freed of their molecules; while the latter, either single or in groups, remain in the serum unaltered. Fragments of the ovate capsules also abound in the same medium, under various though oftentimes regular forms. These changes correspond, in a great measure, with those experienced by the ordinary pus globule, which, if observed in various diseases, will often be found disintegrated, whether in the blood or elsewhere; their molecules being discovered without their matrix, as in the case of the ovate corpuscles, and floating among the other constituents of pus; and the matrix existing entire, split into portions which are still adherent, or resolved into amorphous parts. In one instance, a quantity of chalky matter, deposited in the calyx of the kidney, proved to be composed entirely of pus molecules. In this case pus globules existed plentifully in the blood. Again, although the molecules of the ovate corpuscles, which vary in size, are occasionally much



smaller, they are as frequently of nearly the same diameter as the common pus molecule; and in each circular nucleus there appear one or two molecules of a much larger size. Acetic acid does not appear to act on the ovate corpuscles, except by the aid of slight pressure, which is most conveniently applied between two pieces of glass; and by the same means the pus globule is entirely dissolved. Such is the principal evidence which I have to offer of the identity of pus and the fluid contained in diseased hepatic ducts; not to omit the impossibility of distinguishing one from the other by the naked eye, a proof sufficient in itself where the microscope is not employed.

Although I have examined pus extensively in various diseases, and both in and out of the blood, my observations do not afford sufficient data on which to decide the method of its formation. It may be well, however, to state so much of what I have ascertained as may tend to assist the present discussion. It is not known whether pus is a degradation of the blood globule or a new formation. However, in purulent matter, formed from an accident, it happened to me to find that the globules were exactly the size of those of the blood. There were some pure blood globules, and others resembling them both in magnitude and in the evenness of their circumference, but which had one, two, or more of those characteristic marks of pus which point out the situation in which the molecules are either formed or are in the progress of formation. There were others, of the same size, in which those marks were most distinct, and the edges rough: but in pus produced from changes operating on the general system, or by chronic disease of a part, the globule is from one-third to double the size of the blood globule; it is more flattened than the latter, and has a broken border. This kind of globule may be detected in the blood in all cases in which the system is affected by a local deposit of pus. In the last stage of phthisis the blood was found by Dr. Carswell and myself to contain no other globules than those of pus.

These facts would favour the belief that pus is formed from the blood; and it is a view which, in the present state of our knowledge, I am most disposed to adopt: but, if the ovate corpuscles be purulent, as there is good reason for admitting, there is this difficulty, that they are greater in diameter than many of the vessels composing the plexus before described. The knotted portions of these vessels, however, as well as those which appear to have arrived at their highest degree of dilatation, are considerably larger than these corpuscles; and, since the latter occupy the interstices of their plexus as well as the channel of



the ducts, it is more than probable that they are formed in these reservoirs from the venous blood which principally fills them.

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The greatest diameter to which the varicose capillary veins arrive is the hundredth part of an inch; but they often vary from that to the four-hundredth of an inch in the same branch: but the minutest branches, those which appear of new growth, are as small as the five-thousandth of an inch. By a comparison of the size of the ovate corpuscles, which are about the eight hundred and fiftieth part of an inch in their shortest, and the four hundred and fiftieth of an inch in their longest diameter, with the size of the larger vessels, it will be seen that the latter are sufficiently capacious to contain them.

When the blood globules once reach these varicose sacs, it is highly improbable that they should ever proceed again to the pulmonary system. The extreme tenuity to which the vessels arrive, and their rapid growth, shows how readily parts adapt themselves to circumstances. Instead of depurating the blood, the vessels, by a change of state and increase of their contents, separate pus, as vicarious of bile which is evacuated through the natural channel of the biliary secretion. Dr. Cruveilhier of Paris mentions that, in enlarged ducts of a dog, he found only blood; a case, probably, in which the rupture of varicose capillaries had given rise to hemorrhage. That undue aeration of the blood, whether from extensive pulmonary disease, as in the case of phthisis cited, or from its detention in varicose capillaries, or any other cause, will give rise to the purulent degeneration of the globules, I do not doubt. In persons in whose blood pus has formed during a residence in hospitals, an event of frequent occurrence, all traces of it have disappeared after two or three days spent in a purer atmosphere. On the same principle blood detained in varicose capillaries, instead of being purified by secretion, and afterwards transmitted to the lungs, would degenerate into pus. But how this new form of the pus globule is produced must at present be left undetermined, for no other instances of a secretion of pus from venous blood have been collected in aid of the inquiry.

There were no traces of the ovate corpuscles in the urinary bladder; the chyle also was free from all trace of their presence. Although the blood offered no indications of their existence in the circulation, it presented appearances worthy of notice. In the liver, spleen, and kidneys, the blood globules were confluent; that is to say, had lost their individuality to a greater or less degree,



and had run into each other, forming masses: a state of the blood which I have witnessed under other circumstances, as in fever, hæmorrhoids, &c.; and even in nervous affections, as mental inquietude, palpitation, &c. when there has been no other deviation from health. In the lungs the blood globules were distinct, but often grouped into the form of the ovate corpuscles and their nuclei. In the liver the same groups appeared, but with the globules confluent. Here also the same large globules were observed as in the bile in the earlier stage of the disease.

There were distinctive differences among the ovate corpuscles found in the digestive organs. Those in the stomach appeared to have suffered partial digestion, and in the duodenum there was some variety in their form. (Plate VI.)

The capillary vessels of the stomach and duodenum which I had injected were aneurismal; and, in the parts which they supplied, there was observed a tendency to what in such cases is falsely denominated ulceration, a process which will be presently explained.

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The fact that all morbid productions, whether cancerous, tuberculous, osseous, or of other kinds, may not only co-exist, but be intimately mingled in structure; that these are found connected with purulent, serous, bloody, and other deposits;—this fact, considered by Béclard as one of the greatest sources of difficulty in the study of pathological anatomy,\* may, at the present era, be viewed as a collective proof that one and the same law presides over the development of all disease. Though the nature of this law has been unknown, authors have not failed to detect an intimate alliance between the various forms of carcinoma, so that scirrhus, cancer, medullary or gelatiniform sarcoma, have been called indifferently by the same name; while tubercle and melanosis have been united in the same class on the one hand, and melanosis and cancer on the other.

When Béclard, writing of cancer,† said, “This tissue has less consistence than scirrhus, though more than the cerebral substance; is of a milky white, interrupted, when cut, by red points formed by divided vessels: these, in fact, are very numerous; but their walls are very thin, and scarcely support the force

\* Anat. Gén.

† Béclard and Blandin, Additions à l'Anatomie Générale de Bichât.



of the injection,"—that author was not far off from the efficient cause of the disease; and, had his mind but been in search of that, the probability is that he would have detected the truth, which was thus within his reach.

In tubercle affecting the spleen, I have seen the capillary arteries aneurismal; that they are so in every form of tubercular growth, as well as cancerous, is yet to be proved; meantime, it appears more than likely that, while one common law operates in the nutrition of natural tissues by means of healthy vessels, the deviation from that law is attributable to diseased vessels.

That hemorrhage arises from the rupture of varicose capillaries, is seen in cancerous affections; that it springs from the same causes in all tissues, whether in the pulmonary, cerebral, or any other systems I would not express a doubt, but that research can immediately decide the proposition. These dilated and attenuated vessels, when the disease which they constitute is superficial, having no mechanical support, become gangrenous; a state which gives rise to the destruction of parts involved in malignant disease, and their consequent removal, not by absorption, but by the disintegration of the outer surface.

The capillaries in a healthy state are of a uniform diameter, their size being about that of the blood globule. From this fact it may be implied that, in all tissues which secrete pus, the capillaries are in a state of dilatation; for the pus globule is generally from one-third greater than, to twice the size of, the blood globule; consequently the capillaries which secrete the former must be of a proportionate diameter. This simple truth opens to investigation the state of the capillaries through the large class of scrofulous affections, venereal and other abscesses, and suppurating surfaces of every description.

That in the production of all diseases the capillaries are the active agents there can be no doubt; and, when the extent to which these vessels are liable to undergo change in the production of heterogeneous growths is fully understood, it is to be hoped that the practitioner, with his views enlarged, may find a more certain means of controlling their action.

Should this minute inquiry bring other investigators into the same field of research, it is recommended that the examination of the capillaries should be omitted in no instance whatever, whether in aneurism of the large vessels, varix of the veins, hypertrophy and atrophy of organs, or even in diseases affecting the whole system, as inflammatory and febrile affections.

The scientific treatment of malignant diseases has yet to be discovered. It must be founded on experiments made on animals with medicines for the



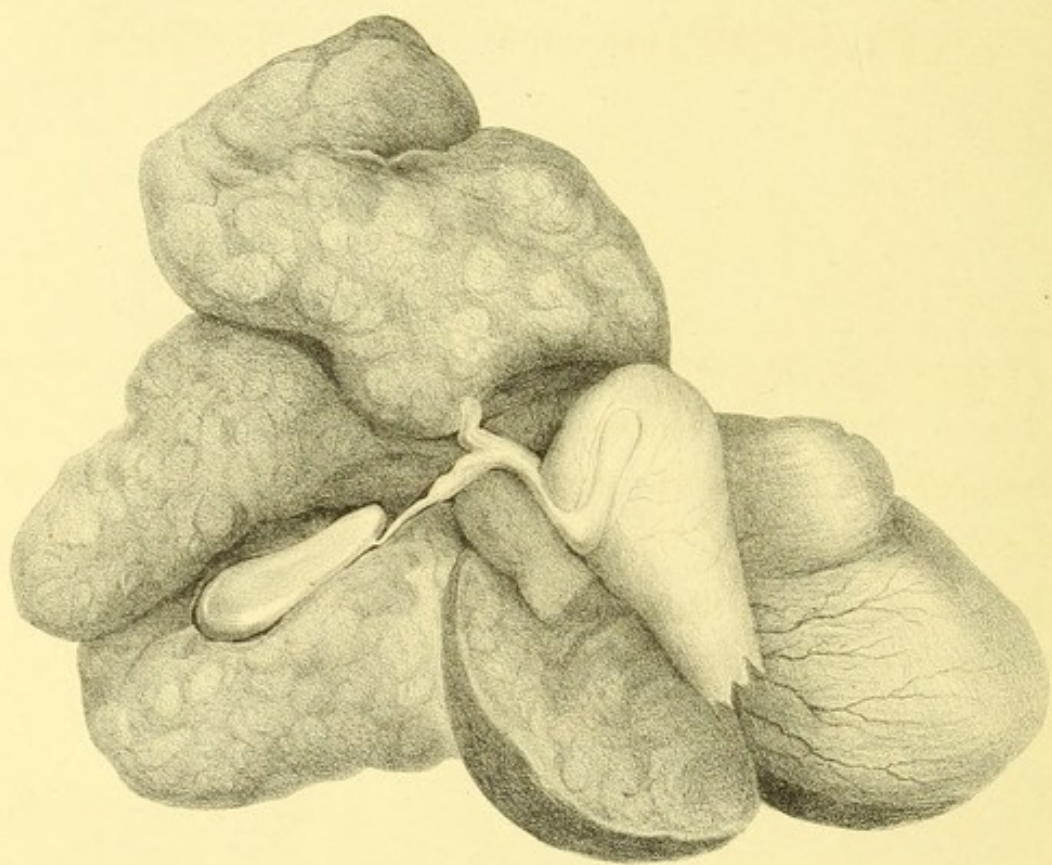
purpose of ascertaining the effect they produce on the capillaries, and on observations of the effects of remedies on the blood, a fluid evidently involved to a greater or less extent in the production of heterogeneous growths. In the mean time, in cases where excision of the disease is impracticable, but where the artery which is distributed to it, and the capillaries of which are aneurismal, is within reach; a ligature might be tried, without danger and with some hope of benefit. And this might be succeeded by venesection and transfusion, cautiously but regularly performed; an experiment which, in prudent hands, could be attended by no danger, but might lead to results which would advance our knowledge of practice in this most fatal class of diseases.







Plate 1.





## EXPLANATION OF THE PLATES.

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### PLATE I.

THIS Plate exhibits the external characters of carcinoma of the hepatic ducts in the rabbit. A part of the duodenum is reflected over the stomach, to show the termination of the ductus communis choledochus. The dilated portions of the hepatic ducts, the gall-bladder, cystic duct, and ductus communis choledochus are seen distended with cancerous matter. The liver appears in a state of sanguineous, as well as purulent, congestion. The vessels distributed to the dilatations of the hepatic ducts are filled with blood.



## PLATE II.

THIS Plate represents the same parts as the former, with the dilatations of the ducts exposed by the removal of the parenchyma of an entire lobe of the liver.



Plate 2.

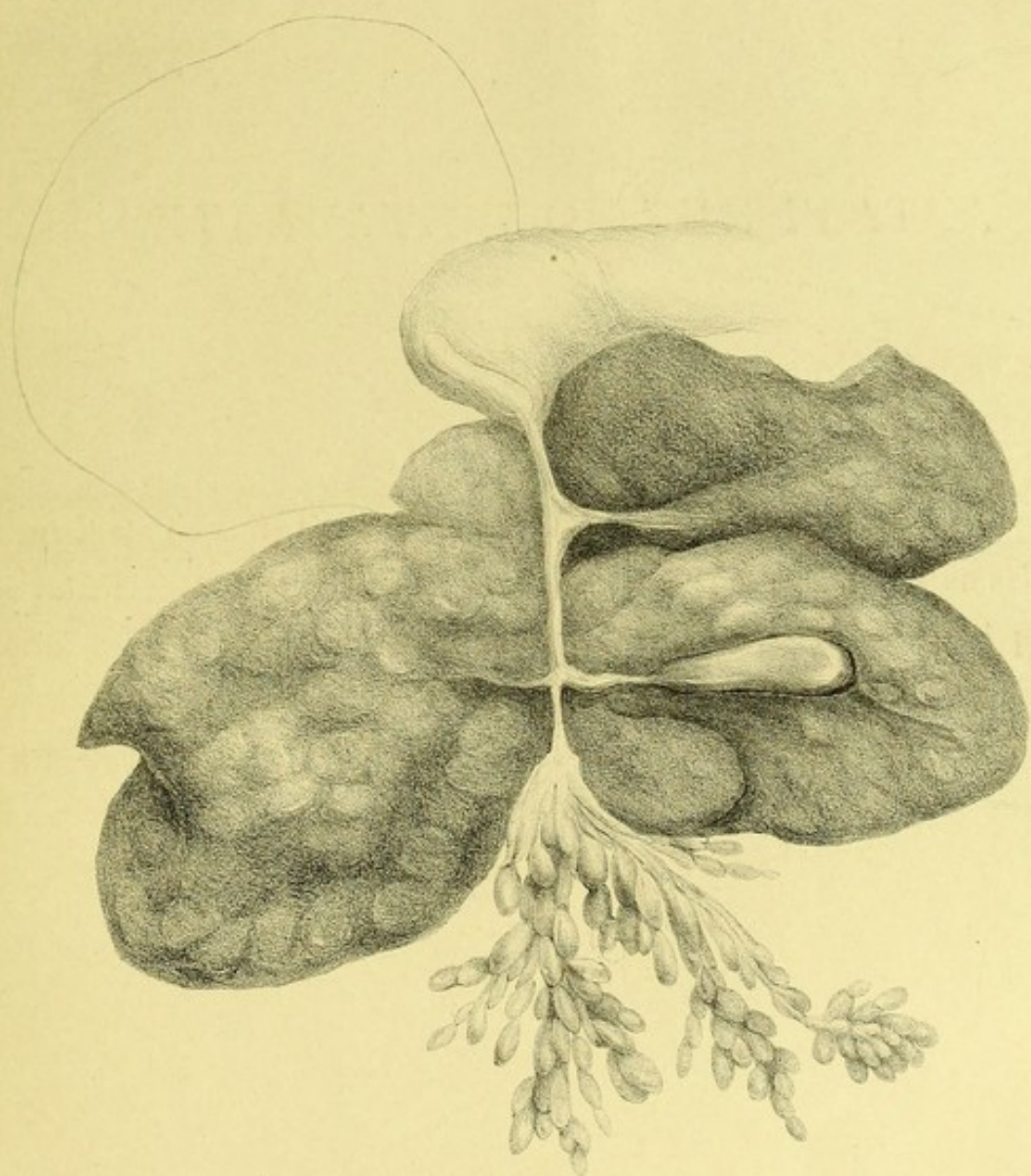




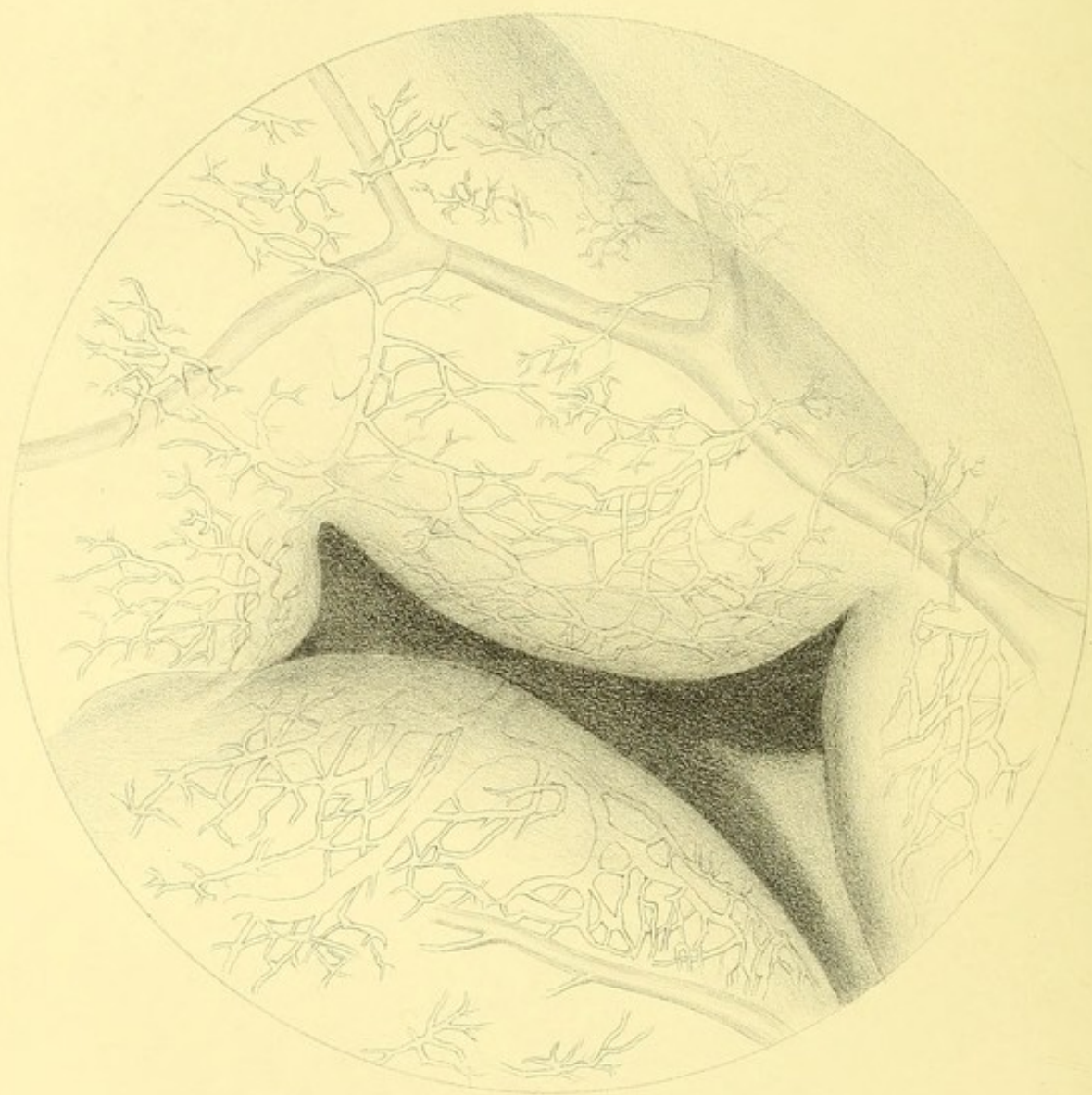








Plate 3.





## PLATE III.

THIS Plate displays the vascular plexus which is distributed to the external surface of the dilated ducts. There are two considerable branches, which do not anastomose with the plexus, but only cross it in their passage to the interior of the ducts: these are derived from the hepatic artery. The plexus itself consists of capillaries, many of which are varicose, derived from the portal vein.

The figure is magnified about thirty times.



## PLATE IV.

THIS Plate exhibits a portion of a duct laid open in the direction of its length to display its cancerous structure. The varicose capillaries, which are figured as having received the injection, are principally derived from the portal vein. It is observable that the narrow portion of the duct, as well as the dilated parts, is the seat of carcinoma.

The figure is magnified about twenty times.



Plate 4

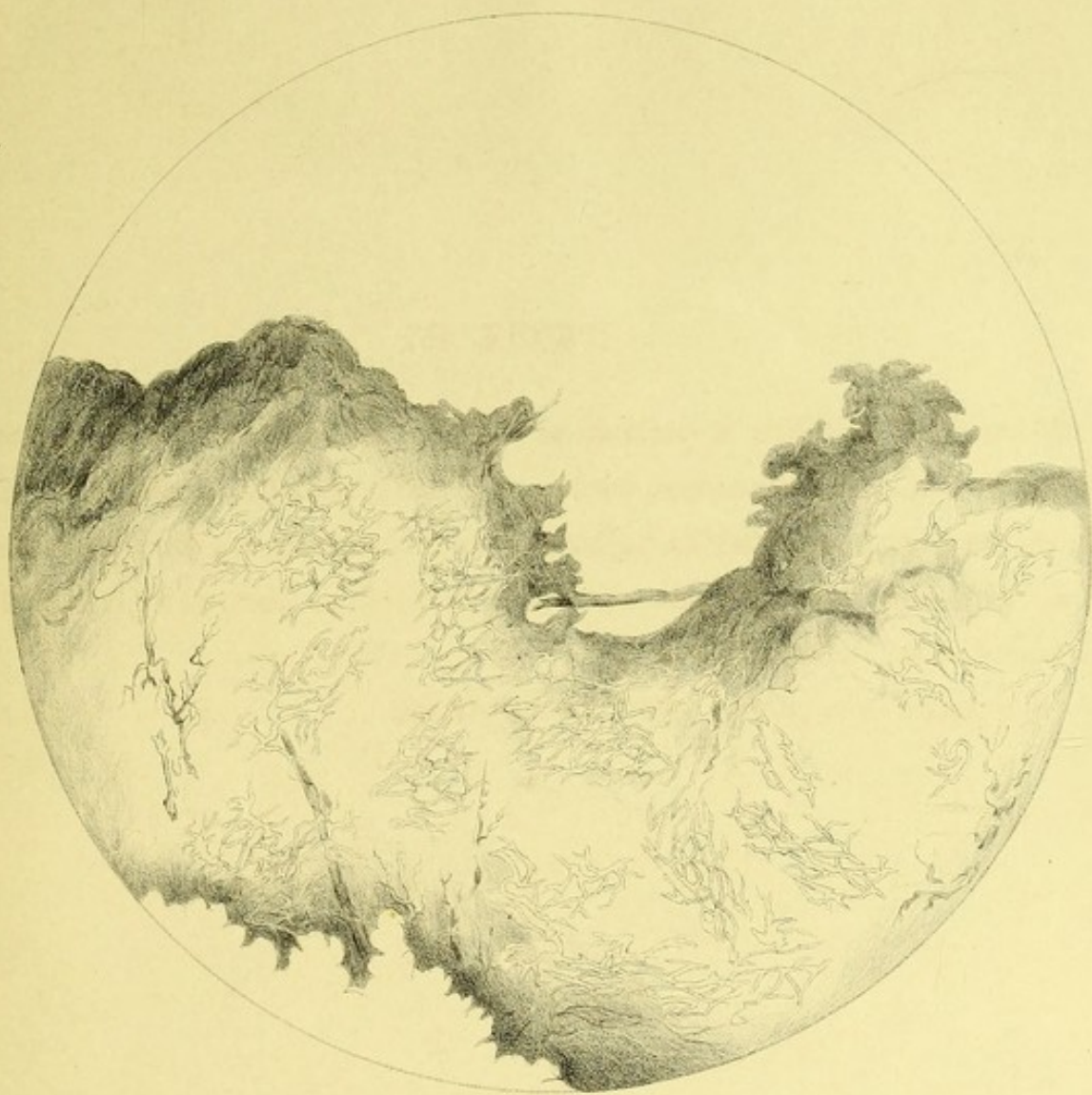












Plate 5.





## PLATE V.

IN this Plate the structure of carcinoma of the hepatic ducts is shown to consist entirely of superimposed plexuses of varicose capillaries. The injection was made from the portal vein. It is in the interstices of these vessels that the matter of cancer is deposited.

The figure is magnified fifty times.



## PLATE VI.

IN this Plate the microscopic appearances of the matter of cancer are represented, together with the changes which the blood and bile undergo in carcinoma of the hepatic ducts.

The figures are magnified about three hundred times.

Figure 1. The normal form of the ovate corpuscles of the matter of cancer found in the gall-bladder, ducts of the liver, and intestines.

2. A deviation from the normal form, in which the central nucleus is expanded to almost the size of its ovate capsule.

3. The same form, in which the central nucleus has lost some of its molecules.

4. Another deviation from the normal form in respect of the position of the central nucleus.

5. The normal form of the corpuscle, with its nucleus partially deprived of molecules.

6. The central nucleus remaining after having entirely lost its molecules.

7. Central nuclei, which have escaped from their ovate capsules, and are deprived in different degrees of their molecules.

8. An ovate capsule deprived of its nucleus.

9, 10, 11, 12, 13. Deviations from the normal form of the corpuscle found in the duodenum.

14, 15, 16. The same, found in the stomach, mingled with chyme.

17, 18. Groups of blood globules found in the blood of the lungs.

19. A form found in the same part.

20. The confluent state of the blood globules, as found in the liver, spleen, kidneys, and other abdominal viscera; while the blood globules in the lungs, heart, and aorta exhibited a healthy appearance.

21, 22. Forms found in the bile, taken from ducts in which dilatation was commencing.

23. Forms found in the blood of the portal vein, and produced by the confluence of the blood globules.

24. The same.







