ON
EXTRAVASATIONS OF BLOOD

INTO THE
CAVITY OF THE ARACHNOID,
AND ON THE FORMATION OF THE FALSE MEMBRANE WHICH
SOMETIMES ENVELOPS THESE EXTRAVASATIONS.

By PRESCOTT HEWETT, Esq.,
CURATOR OF ST. GEORGE'S PATHOLOGICAL MUSEUM.

Received January 10th—Read February 11th, 1845.

THE extravasations of blood treated of in this paper have of late years been carefully examined by several French pathologists, as one of the forms of their "Apoplexie des Méninges ;" but these affections have not, as far as I am aware, received from English pathologists that degree of attention which they will, I think, be found to deserve.* As I have had opportunities of investigating several of these extravasations, and the various appearances arising from them, many of which are closely linked to some of the most important points in Pathology, I trust that the following observations will be acceptable to the Society.

Blood extravasated into the cavity of the arach-

* At the time when this was written, I was not aware that Dr. G. Burrows had, in his Croonian Lectures, published some cases and observations which are very analogous to some of the observations mentioned in this paper.—See Dr. Burrows' Croonian Lectures, 1835, Medical Gazette, vol. xvi. p. 710.

noid membrane may there be found in different states, which, for the sake of perspicuity, I shall arrange in four divisions, according to their degrees of simplicity.

1. The extravasated blood may be either liquid or coagulated ; if in the latter state, it may be in clots, or spread out in the shape of a thin membranous layer, covering a greater or lesser extent of the surface of the brain.

2. Sometimes the extravasation presents itself under the shape of a false membrane, possessing more or less of the original colour of the blood ; in some cases it is even reduced to the fibrine only, and of a slightly yellowish tinge.

3. The blood may be fixed to the free surface of the arachnoid, and there maintained by a membrane, which to the naked eye presents all the characters of the serous membrane itself.

4. The blood is frequently found enclosed in a complete cyst, of various degrees of thickness, which may be removed unbroken from the cavity of the serous membrane.

The four divisions-above referred to may be, and often are, combined with each other, but, in whatever state the extravasated blood has been found, it has, in the majority of cases, corresponded to the upper surface of the brain, and has been rarely met with in the cerebellic fossæ.

FIRST DIVISION.

The main feature of this division is, that it forms

a most important link in the appearances about to be examined; for in these cases there never has been any difficulty about defining the exact nature and situation of the disease.

Case 1.—J. W., ætat. 45, was admitted into St. George's Hospital, in the beginning of 1841, under Dr. Hope, in an advanced stage of phthisis, of which he died, a few days after his admission. During the residence of this patient in the Hospital, he was repeatedly attacked with delirium.

Examination 39 hours after death.—Covering the free surface of the parietal arachnoid, which lines the right middle fossa of the skull, was a large coagulum of blood, measuring, in some places, two lines in thickness. This coagulum, of a fawn colour towards its cerebral surface, was flattened and spread out, but it had not contracted any adhesions with either of the layers of the arachnoid. The brain and its membranes did not present any other trace of disease; the source of the hæmorrhage was not discovered. No marks of external violence existed in any part of the skull.

Cases of this kind may be found in various authors. In one of the *three* cases so often quoted from Rostan,* as cases “of extravasation of blood between the parietal arachnoid and the dura mater,” it is distinctly stated by that author, that the blood was effused into the *cavity* of the *arachnoid*, where it was found in large dark-coloured clots. Abercrombie†

* Rostan, sur le Ramollissement du Cerveau. Obs. 91.

† On Diseases of the Brain, p. 243.

mentions a case of this nature in which the extravasated blood was closely adherent to the inner surface of the dura mater, from which it could be peeled off like a membrane ; the brain was healthy.

SECOND DIVISION.

The thin, membrane-like layer of coagulated blood, mentioned in the preceding paragraph, evidently gives rise to the appearances noticed in this division. Once thus spread out, the coagulum after some little time loses its colouring matter ; the fibrine, of different hues, is left, and then gives rise to a false membrane, of various degrees of thickness.

The membranous appearance which coagula sometimes put on, in the cavity of the arachnoid, has been known to pathologists for many years. Among Sir B. Brodie's preparations, there is one, put up in 1826, which is thus described :*—"Layer of coagulated blood, presenting the appearance of a false membrane on the under surface of the dura mater."

The following case affords a good illustration of the appearances which these extravasations of blood sometimes give rise to.

Case 2.—S. S., ætat. 73, was admitted into St. George's Hospital under Mr. Tatum, on the 23rd of July 1844, with concussion of the brain, and a small lacerated wound over the external angular process of the right frontal bone, which however

* Catalogue of Sir B. Brodie's Museum, D. 2.

was not exposed. There was some bleeding at the nose, and the eye-lids were very much ecchymosed. At the back of the right hand, there was a large lacerated wound, exposing the extensor tendons. Shortly before her admission she had been run over by a cab.

She soon recovered from the effects of the concussion, and then vomited some blood which, it appeared, had been swallowed. For some days she was confined to her bed by sloughing of the wound on the hand, and inflammation of the absorbents, accompanied by low, typhoid symptoms, but she rallied, and was ultimately able to go about the ward. She was about to be discharged from the Hospital, when erysipelas appeared on the hand, which soon began to slough again. Typhoid symptoms came on, and she fell into a state of torpor, from which she was, however, easily roused, and answered all questions very well ; there never was any paralysis. In this state she continued for some days, and died on the 20th of September.

Examination twenty-nine hours after death.—In the cavity of the arachnoid, on either side of the falx, were the remains of a very extensive effusion of blood. On the left side, the remains of the extravasation consisted of a firm, membranous layer, which lined the parietal arachnoid, upon which it was gradually lost, corresponding to the whole of the upper surface of this hemisphere of the brain. This false membrane, of a reddish brown colour, and a line in thickness, was divisible into thin layers, between which, in some places, there were some

circumscribed cysts, containing bloody serum and coagula. On the right side, the extravasation occupied a much greater extent than on the left; it corresponded to the lateral parts, and to the middle fossa of the skull, as well as to the whole of the upper surface of the hemisphere. At the lateral and inferior parts, the extravasated blood formed a large, firm, dark coagulum, two lines in thickness, enveloped in a firm membrane of a yellowish colour, but at the upper part it presented appearances similar to those observed on the left side, with the exception of the membrane being thicker, and having in its centre one large cyst only. These membranes were united, in the whole of their extent, by one of their surfaces, to the parietal arachnoid; on the other surface they were perfectly smooth and polished, presenting to the naked eye all the characters of a true serous tissue, but they were easily detached, with the cysts and coagula in their structure, from the serous membrane. These membranes were throughout their whole structure most plentifully supplied with blood-vessels. The visceral arachnoid presented its usual polished appearance, and it was neither thickened nor discoloured. The brain was healthy, both in colour and in structure; the main arteries at its base presented several patches of atheromatous deposit. The source of the hæmorrhage was not discovered. There were no marks of violence about the external parts of the skull.

The false membranes, arising from extravasation

of blood, may be found loose in the cavity of the arachnoid, attached to one of the free surfaces of that membrane; or they may become a bond of union between its two layers, and this, too, without the intervention of any inflammatory action.

In the great majority of cases, however, the false membrane is connected with the parietal arachnoid only, to which it is pretty firmly attached; its free surface, corresponding to the visceral arachnoid, being perfectly smooth and polished, and presenting all the characters of a serous tissue; under these circumstances it is generally supplied plenteously with blood-vessels. When thick, this membrane is oftentimes divisible into distinct layers; of which, the external ones are of a light colour, whilst the internal ones still possess more or less of the colour of the blood. Clots of blood, of various sizes and colours, are not unfrequently found, either in the structure of the membrane, or upon one of its surfaces. These clots may have proceeded either from the vessels of the arachnoid, or from those of the adventitious tissue. Cysts containing serum and blood, or serum alone, are also met with in these membranes.

The newly-formed tissue is at times soft and pulpy; at other times having existed for a long period, and undergone various changes, it presents a fibrous, a leathery, and even a cartilaginous appearance. In these states, if firmly attached to the parietal arachnoid, the membrane is very likely to be mistaken for diseases of a very different character;

thus, the appearances now under consideration have been referred to chronic inflammation, either of the dura mater, or of the arachnoid, with thickening of these membranes; they have also been described as the result of inflammation of the meninges, producing an exudation of coagulable lymph upon the free surface of the arachnoid.

In Mr. Cæsar Hawkins's Museum, there is a preparation* which will, I think, serve to illustrate this point very well. It consists of a large portion of the dura mater from an adult, with extensive false membranes, attached to the parietal arachnoid, which are supposed to have been the result of inflammation ending in an exudation of lymph; but, from a careful examination of the preparation, I am of opinion that these membranes are the result of extravasations of blood, of long standing. On the right side of the falx, the false membrane is composed of three distinct layers, the two external ones being pellucid and of a white colour, the central one being about two lines in thickness, opaque, and of a mottled colour, yellow in some parts, and of a brownish red in others. On the left side of the falx, the false membrane has not been separated into layers; it is about two lines in thickness, opaque, and white, except in patches where it is of an orange colour. The free surfaces of these membranes are for the greater part smooth, but in some places they present a flocculent appearance.

I am inclined to think that Dr. Abercrombie's

* Catalogue of Mr. Cæsar Hawkins's Museum, J. a. 5.

Case* “ of remarkable thickening of the dura mater, with separation of its laminæ, and a deposition of a new matter betwixt them, with a cavity containing yellowish serous fluid,” belonged originally to an extravasation of blood into the cavity of the arachnoid, rather than to a chronic inflammation of the dura mater. The history of the case, the symptoms, and the morbid appearances, belong precisely to these extravasations; especially when they have been, as this was, of long standing. At the time at which that case was drawn up, but little attention had been paid to the accurate definition of the affections of the various membranes of the brain. The false membrane being closely connected with the parietal arachnoid, and having, from the time of the existence of the disease, (two years,) undergone various changes, it may, I think, be fairly supposed, that Dr. Abercrombie was misled as to the true seat of the morbid deposit.

Dr. Bayle† has minutely described, under the head of “ chronic meningitis with false membranes in the cavity of the arachnoid,” 13 cases, in some of which, if not in all, the membrane owed, I think, its origin to an extravasation of blood, and not to an exudation of lymph the result of inflammation, as that author supposes. To this opinion I have been led by a careful perusal of the descriptions given by Dr. Bayle, as well as by other considerations. In every one of Dr. Bayle’s cases, the false membrane was either of a red colour, or it presented

* Diseases of the Brain, p. 49.

† Maladies du Cerveau et de ses Membranes.

the various hues which are known to depend upon the colouring matter of the blood ; in the majority of the cases, clots of blood, of various sizes, were mixed with the false membrane ; in some of them it is distinctly stated that the membrane presented the appearance of a thin and flat coagulum, whilst in others the description tallies exactly with the appearances which will be hereafter described in the Third Division. To account for the frequent admixture of blood, which Dr. Bayle found in these cases, he has been driven to the supposition, that the nature of the inflammatory action had changed at different periods, so as at one time to produce an albuminous secretion, then a secretion of blood, followed by another albuminous secretion ; now it is by no means so common an occurrence, as these cases would lead us to suppose, to find *clots of blood* mixed with the effusions resulting from inflammation.

Another circumstance which must be taken into consideration, is the comparative rarity of inflammatory effusions into the cavity of the arachnoid, whereas extravasations of blood have often been met with in this situation, since the attention of pathologists has been directed to this affection. Mr. Baillarger,* who has had frequent opportunities of examining these membranes, under circumstances precisely similar to those of Dr. Bayle, has also come to the conclusion that, in the majority of these cases, the membranes are the result of an extravasation of blood, of more or less standing.

* Bulletins de la Société Anatomique de Paris, 1834, p. 86.

THIRD DIVISION.

In this division have been classed the cases in which the extravasated blood is fixed to the free surface of the parietal arachnoid by a fine, delicate, transparent membrane, apparently possessing all the characters of the serous membrane itself, of which it, at first sight, appears to be a part. Of these appearances, the two following cases are good examples.

Case 3.—In the early part of 1841, Mrs.—— ætat. 65, after having for several days suffered from great mental excitement, was suddenly seized with violent pain confined to the right brow, which lasted for two or three hours, and then disappeared. This pain continued for several days to recur twice in the twenty-four hours, presenting all the characters of brow ague ; it was apparently relieved by quinine, but it was followed by a train of low symptoms, accompanied by a dry brown tongue, wandering and impairment of the intellectual faculties, terminating in coma. There never was any paralysis, neither were any contractions of the limbs observed. The patient died twelve days after the first attack of pain.

The body was examined about twenty-four hours after death. The veins of the scalp were gorged with blood. The dura mater, on the right side, appeared to be somewhat thicker than natural. A large quantity of blood was found extravasated in the cavity of the arachnoid ; it corresponded both to the upper and to the inferior surfaces of the right hemi-

sphere, and a small quantity of it had even made its way into the corresponding cerebellic fossa, where it was lying on the margin of the foramen magnum ; the whole of this extravasated blood was of a dark fawn colour. At the base of the skull the extravasation at first sight appeared to have taken place between the dura mater and its arachnoid lining, for the blood was covered by a thin, smooth and polished membrane, presenting to the naked eye all the characters of the serous tissue, with which it was perfectly continuous, at the margins of the extravasation ; but this membrane and the clot were easily removed, and the arachnoid was then found slightly roughened, but uninterrupted throughout in its continuity. The substance of the brain was healthy, but its ventricles contained some fluid. The source of the hæmorrhage was not discovered. No marks of external violence existed about the cranium.

Case 4.—J. G., ætat. 25, was admitted into St. George's Hospital, in July 1842, under Dr. Wilson, in an advanced stage of phthisis, of which she died a month after her admission. During her residence in the Hospital, this patient had frequent attacks of violent delirium ; her father had died maniacal, and for some time previous to her death she had been addicted to drinking.

The body was examined eighteen hours after death. The dura mater was somewhat more firmly adherent to the calvaria than usual. In the cavity of the arachnoid, and corresponding on either side of the falx to the centre of the upper surfaces of

both hemispheres of the brain, was a thin layer of coagulated blood firmly attached to the parietal arachnoid, where it was confined by a thin, delicate membrane of a fawn colour, presenting towards its free surface all the characters of the original serous tissue, to which it was most perfectly adapted ; but these appearances were ascertained to be produced by a false membrane similar to that described in the preceding case ; and after the removal of the coagula, the arachnoid was found slightly roughened and discoloured. The cells of the pia mater were filled by an extensive effusion of serum ; the substance of the brain was healthy. The source of the hæmorrhage was not discovered : no marks of external violence existed about the cranium.

This class of cases derives an increased degree of interest from the fact that these extravasations of blood were for many years described as having taken place between the dura mater and the parietal arachnoid, which membranes were thus supposed to have been widely separated from each other. Cases of this nature thus described, may be found in the works of Rostan, Andral, Cruveilhier, Dr. Hodgkin, and several other authors.

Dr. Hodgkin,* in 1836, having alluded to Rostan's cases as a strong proof of the existence of a parietal arachnoid, gives the details of a case of this nature, which had occurred at Guy's Hospital, upon which

* Lectures on the Morbid Anatomy of Serous Membranes, p. 83.

he makes the following observations : “ The extravasated blood presented, for the most part, a smooth, polished surface towards the visceral arachnoid, and was covered by a thin, even, firm and generally transparent membrane, which, in some parts, *seemed to be double*, having the effused blood between its layers. This delicate membrane could be nothing else than a portion of arachnoid reflected over the dura mater, and giving it its polished surface. Though very thin, it was too firm and resisting, to be regarded as a false membrane formed from the fibrine of the effused blood. The dura mater, when this membrane was peeled off, lost its natural polish, and exhibited its fibrous texture.”

It is with diffidence that I venture to offer an opinion contrary to that expressed by Dr. Hodgkin ; but, since the publication of the case above referred to, the result of the investigations which have been carried on by several pathologists and by myself, is so directly opposed to this view, that I cannot but think that Dr. Hodgkin has been led into an error, of which the case itself will, I think, be found to bear internal evidence ; for, supposing this membrane to have been a portion of the parietal arachnoid stripped off from the dura mater, I cannot account for that *membrane* appearing to be in some parts *double*.

The pathological investigations carried on within the last few years by Messrs. Longet, Baillarger, Calmeil, Ernest Boudet, and others, have all shown that the fine, delicate membrane which covers these extravasations of blood, and which presents to the

naked eye all the characters of a serous tissue, is a newly-formed membrane, so beautifully adapted to the original serous membrane, that it is only with the utmost care that the exact limits of each can be defined. The cases of this nature which I have examined, have afforded me an opportunity of verifying the accuracy of this opinion ; and in speaking of the formation of this membrane, I shall bring forward several examples, which will, I trust, prove that it is much more frequently and much more rapidly formed than is usually supposed.

Blood extravasated, and thus connected to the parietal arachnoid, may present itself under two different aspects : it may either be collected in one cavity ; or it may be disseminated in patches, of various sizes and thickness, over the surface of the serous membrane, the intervening parts of which present a natural aspect : of the first kind, cases three and four are good illustrations ; of the latter kind I have lately examined a very good specimen, in an injury of the brain, with extravasation of blood into the cavity of the arachnoid—the patient lived nine days after the accident, and each patch of blood was found already covered by its own membrane. In Guy's Museum there is a beautiful specimen, described in the catalogue “as patches of blood effused between the dura mater and its arachnoid lining,” which, I think, belongs to the class of cases at present under consideration. To this kind, I am also inclined to refer the patches, of various sizes, of a reddish brown or dark yellow colour, described by

Dr. Foville* as separating the arachnoid from the dura mater ; with which patches, this author in another paragraph states that extravasations of blood are not unfrequently connected. The patches are, I presume, nothing but these disseminated extravasations of blood, which have lost more or less of their colouring matter. Even Dr. Foville, although he classes these appearances under his "*Méningite pariétale*," states that their inflammatory nature is not sufficiently well established, for him to enter into a detailed account of the various circumstances connected with them.

In this class of cases the collections of blood have never, that I am aware of, been found fixed to the free surface of the visceral arachnoid ; even where the blood has proceeded from a laceration of the brain, I have found it fixed to the parietal layer of the serous membrane.

FOURTH DIVISION.

The true nature and situation of those collections of blood, described by many pathologists as being situated between the dura mater and its arachnoid lining, are most easily detected in the cases classed in this division, where the blood is contained in a completely closed bag, which may be detached from the parietal arachnoid, and, with its contents, removed unbroken from its situation.

The existence of these encysted collections has

* Dict. de Méd. et de Chir. Prat.—Article, "*Méningite*."

been known to pathologists for many years,* but their identity with the supposed extravasations of blood between the dura mater and the arachnoid was, as far as I know, first pointed out by Mr. Baillarger in 1834. The appearances which these collections of blood present, are well exemplified in the following case.

Case 5.—E. W., ætat. 51, was admitted, on the 10th of March 1844, into St George's Hospital, under the care of Dr. Wilson. At the time of the admission of this patient, he was nearly in a state of insensibility, with some low muttering delirium. Both the inferior extremities were partially paralysed, the right more so than the left: the right superior extremity was also similarly affected—the hand of this side was blue and swollen. The pulse was remarkably slow and weak: the tongue white: the bowels open: there was no distention of the bladder. It was stated by his daughter, who brought him to the Hospital, that, for the last two years, he had been complaining of his head, but that he had always been able to continue his occupation, as a carrier, up to within the last six days, when he was taken ill on the road, as he was coming with his waggon from Cromer, from which period he had been confined to his bed. It was further stated that, of late, he had had a good deal of anxiety. After having been in the Hospital for a few days, he rallied so far, as to be able to answer all

* Catalogue of Sir B. Brodie's Museum, 1826, D. 16.

the questions which were put to him ; but his intellectual faculties still remained weak, and his memory was very defective. He also regained some power over his inferior extremities, which he was able to draw up in bed. During the period of his existence in the Hospital, a marked alternation was observed in the symptoms, which, some days, appeared to be greatly relieved, and at other times much increased, with affection of the speech, and paralysis of the bladder. Towards the latter part of his life, the symptoms put on a typhoid character, in which state they remained until the death of the patient, which took place on the 16th of April. The day before his death, he so far rallied as to be able to recognise his daughter. The treatment consisted of local bleeding, with purgatives, and gentle stimulants. The preceding notes were taken from Dr. Wilson's case-book.

On the examination nineteen hours after death, I found the frontal bone studded, in several places, with deposits of a scrofulous nature, which had, apparently, been originally situated in the diploë, from whence they had, in some parts, caused the absorption of both tables, and in other parts that of the external table only. The external surface of the dura mater presented no morbid appearances worth noticing. Connected with the parietal arachnoid were two remarkable collections of blood, one on either side of the falx. At first sight, these extravasations appeared to have taken place between the dura mater and its serous lining, dissecting off the

latter to a great extent ; but, after a careful dissection, it was ascertained that these appearances depended upon a false membrane, which formed over each extravasation a complete cyst, connected by one of its surfaces to the parietal arachnoid ; whilst the other surface, being perfectly smooth and polished, presented all the characters of the original serous tissue, to which it was so beautifully adapted, that it was with difficulty ascertained where the respective membranes began. The connections of the left cyst with the serous membrane were somewhat looser than those of the right, so that that cyst was more readily peeled off from the arachnoid, which was found somewhat roughened, but not discoloured. Each of the false membranes extended far beyond the cysts, and lined the greater part of the parietal arachnoid, corresponding to the upper surfaces of the hemispheres ; but the right cyst was much larger, and much more prominent, than the left. The walls of the cysts were much thicker than any other part of the false membranes, which were bevelled off, and gradually lost upon the serous tissue ; on the left side, the cyst was about a line in thickness. The right membrane was of a yellowish brown colour ; the left was of a light yellow. The cavity of the right cyst contained bloody fluid and coagulated blood, amounting in all to about ʒiv ; the coagula presented various colours—some were dark, some of a rusty, and others of a yellow-ochre colour ; the cavity of the left cyst was not more than a quarter of the size of that of the right,

and its coagula were much more solid. Both cysts were perfectly smooth on their internal surfaces, except at a few points, where some fibrinous coagula were adhering to them. The margins of the membrane on the right side presented, at their junction to the serous tissue, a network of vessels, most beautifully injected, which proceeded in countless numbers towards the cyst. The visceral arachnoid was throughout perfectly sound, and unconnected with either cyst; but on the right side, both the brain and its investing membranes were deeply tinged with yellow. The hemisphere of the brain, corresponding to the right cyst, presented a deep cup-like surface. The substance of the brain, with the exception of the discoloration above mentioned, was healthy in its aspect, but its ventricles were distended with serum. The superior longitudinal sinus, and the upper part of both lateral sinuses, were perfectly healthy. The source of the hæmorrhage remained undiscovered. There were no marks of external violence about the skull.

Encysted collections of blood, such as those described in the preceding case, have been found in various parts of the cavity of the arachnoid; but in the great majority of cases, these collections correspond to the upper surface of the hemispheres of the brain. The connections of these bags with the free surfaces of the serous membrane in which they are lodged, are sometimes so slender that they appear all but loose; at other times, these bags are pretty firmly connected, both with the parietal and with

the visceral arachnoid, but most frequently they are connected with the parietal arachnoid only, to which they are sometimes most beautifully adapted ; and, in this case, so much do they, on their free surface, partake of the character of an original serous tissue, that they appear, at first sight, to be a part of diseased and thickened arachnoid stripped off the fibrous membrane.

If the disease be of some standing, the cavity of the cyst may be perfectly smooth and polished, or it may be intersected by fibro-cellular bands, running in various directions : sometimes fibrinous clots are found adhering to this internal surface.

After a certain period, the membranes forming these cysts become thoroughly supplied with blood-vessels, which may be seen in countless numbers, permeating their whole structure ; in several cases it has been noticed, that a minute network of vessels, most beautifully injected, is found at the margins of the new tissue, thus marking the point of union between the original and the false membranes. Thus organized, these cysts possess all the physiological characters of an original serous membrane ; they secrete, they absorb ; they have been found filled with clots of fibrine and blood-tinged serum ; sometimes they contain serum alone, of various colours, and oftentimes, in the cavity of the same cyst, are found coagula of blood of various hues,* some recently effused, and others of long standing. In one case, given by Abercrom-

* Case No. 5 ; and Ernest Boudet, " De l'hémorrhagie des Méninges," p. 23.

bie,* all the contents of the cyst had disappeared, and the cyst itself was found flattened and perfectly collapsed. Some French pathologists think that the cavities of these cysts may be obliterated by adhesions taking place between their walls ; but with such appearances as those described, I see no possibility of deciding whether a large cyst ever did exist, or whether the false membrane did not originally belong to the cases already alluded to in the Second Division of this paper.

I cannot dismiss this part of the subject, without alluding to the great similarity which exists between these cases and those described by Dr. Foville, as the result of true arachnoiditis. So little do the accurate descriptions, given by Dr. Foville, resemble those of the inflammatory effusions observed by other pathologists, and so much do they resemble the cysts formed round extravasations of blood into the cavity of the arachnoid, that I cannot but think that they must have belonged to this class of cases. In each case the cyst was of a *yellow* colour ; in five cases out of the six, it contained serum only, but in the sixth it was filled by a *considerable quantity of blood*.

In some cases, where encysted collections of blood have been found in the cavity of the arachnoid, it has been noticed that the visceral arachnoid, pia mater and brain have been blood-stained. Mr. Calmeil† thinks that this discoloration may be made use of, as a means of deciding whether the

* Loc. cit. p. 277.

† Dict. de Méd., 2^e édit., p. 462.

cyst preceded or followed the extravasated blood. I do not think that this test can be admitted as a valid one ; for, if blood extravasated into the cavity of the arachnoid can stain the pia mater and brain, why should it not produce the same effect by transuding through the walls of the cyst ? what is there to prevent transudation from taking place through a false membrane, as easily as through an original one ? This transudation, it is well known, often takes place after death : of this I observed a good example some short time back, in which an extensive extravasation of blood into a complete and thick cyst, situated below the fascia of the neck, did not, during life, produce any discoloration of the skin ; but in a few hours after death, the skin, in the neighbourhood, became extensively discoloured.

In the history of these encysted extravasations in the cavity of the arachnoid, one of the most interesting studies is that of the formation of the false membrane, so often alluded to, by which the extravasated blood is subsequently, either partially or wholly, surrounded, as in the Third and Fourth Divisions of this paper.

The most generally-received opinion is, that an exudation of lymph, consequent upon the arachnoid being irritated by the presence of the blood, takes place, and surrounds the extravasation ; this explanation may serve for some few cases, but it will certainly not do so for the majority. I am convinced that the opinion, broached by some pathologists, of the membrane being, *in some cases*, formed from the

blood itself, will be applicable to *a very large majority of these extravasations* ; and I shall now bring forward several examples which, I trust, will tend to prove that this membrane is wholly formed by the coagulated fibrine of the extravasated blood, and not by a secretion of lymph, as is usually supposed. To avoid any misconception on this point, I have carefully selected cases in which there were no appearances of inflammation either during life, or after death.

Blood extravasated into various serous cavities, and covered over by a false membrane, without the least trace of inflammation in the neighbouring tissues.

In a patient, who lived nine days after an extensive laceration of the brain and its investing membranes, I found, in the cavity of the arachnoid, on the left side, a large quantity of recently-effused blood, part of which was fluid ; the greater part, however, was coagulated, and divided into a visceral and a parietal portion. The visceral portion formed a firm, smooth, and flattened clot, of about two lines in thickness, covering the whole of the arachnoid of the upper surface of the cerebral hemisphere, with which it was merely in contact. The parietal portion was formed by clots, of various size and thickness, firmly attached to the free surface of the parietal arachnoid by a thin, delicate membrane, of a fawn colour, which had a smooth and polished surface, and, at its margins, was bevelled off, so that

it appeared to be continuous with the original serous tissue, part of which it might have been taken for, on the supposition that the blood had been effused between the dura mater and its serous lining. The clots and their coverings were, however, easily removed with the nail, and the arachnoid was then found but slightly roughened by the contact of the blood.

In the left cerebral ventricle of a woman who died with symptoms of apoplexy, I found a large, solid coagulum of blood, enveloped in a fine, transparent cyst, perfectly polished on its free surface, except at the part where it was adherent to the membrane covering the corpus striatum, and anterior part of the thalamus: these adhesions were easily destroyed with the finger. In the structure of the membrane forming the cyst, was a most delicate net-work of vessels, beautifully injected; the blood contained in the cyst was quite solid, and of a variegated appearance, being in some parts of a fawn colour, in some of a yellow ochre, and in others of a deep red brown. The other parts of the ventricle were filled with a recent effusion of blood, the source of which was traced to the substance of the thalamus. The membrane lining the ventricle was slightly thickened, and of a deep yellow ochre.

In 1841 I examined the body of a man who died a few days after having been tapped for dropsy, depending on cirrhosis of the liver. The serum which was in the cavity of the peritoneum was deeply tinged with blood. Coagula of blood were

found in various parts of the abdomen: several of them were situated on the anterior abdominal parietes, in the neighbourhood of the wound made by the trocar in the linea alba. These coagula, of a dark fawn colour, were covered over, and maintained in their situation by a fine transparent membrane, perfectly continuous with the parietal peritoneum, and presenting all the characters of a true serous tissue. At first, it appeared as if the blood were situated between the fascia transversalis and the peritoneum, but this appearance was easily destroyed by the removal of the coagula and their false membranes, and the peritoneum was then found only slightly roughened by the contact of the blood. There were no traces of inflammation about the peritoneum.

In July 1844, a man was admitted into St. George's Hospital, under Mr. Cutler, for a severe injury of the chest, with laceration of the lung, after which he lived five days. In the cavities of both pleuræ were large quantities of bloody fluid; on the pleuræ costales were several large clots of dark-coloured blood fixed to this situation by a transparent whitish membrane, perfectly smooth on its free surface, and presenting the appearance of the pleura having been extensively stripped off, with the blood situated behind it; but the clots and their membranes were easily removed, and the pleura was found still firmly adhering to the subjacent tissues. In some points the false membrane formed a complete cyst, containing the thinner part of the blood, which was easily removed unbroken from its situa-

tion. There were no signs whatsoever of inflammation in either pleural bag.

A middle-aged man was admitted into St. George's Hospital, under Mr. Cutler, in October 1844, with a severe injury of the chest. He lived eleven days after the accident, six of which he was in the Hospital, and during this time he never presented a single inflammatory symptom. The cavity of the left pleura, completely filled with bloody fluid, of a deep colour, was subdivided into two compartments by a portion of coloured fibrine, presenting a honey-combed appearance, which passed from the ribs to the lung; the lower compartment was itself subdivided into several lodges, by other layers of coloured fibrine intersecting each other. Large portions of loosely-coagulated blood were found in all these cavities; some of these clots were of a rusty colour, others approached nearer to the natural colour of the blood. The lung was compressed against the spine, and the whole surface of the pleural sac was coated by a false membrane, about two lines in thickness, formed by coagulated fibrine. The fibrine which lined the pleura pulmonalis was, towards its free surface, loosely coagulated, but towards the lung it was dense, firm, and of a yellowish colour: that which lined the greater part of the pleura pulmonalis and pleura diaphragmatica presented, on its inner surface, a smooth and polished appearance, and in colour exactly resembled the yellowish fibrine found in the clots of the heart of this patient. So uniform was this coating,

and so continuous was it, throughout its whole extent, that it looked, at first, merely like thickened pleura; but this appearance was easily destroyed by peeling off this adventitious membrane from the serous tissue, which then presented the same appearances as the pleura on the opposite side, with the exception of not being quite so smooth: there was neither thickening nor the slightest increase of vascularity about this pleura. A large rent, from which the hæmorrhage had proceeded, was found in the substance of the lung.

Blood effused into joints presents at times appearances similar to those observed in the extravasations of blood into serous cavities, as described in the preceding cases.

In October 1844, in the knee-joints of a man who had been confined to his bed for a long time by paraplegia, I found flattened clots of blood lying in cupped surfaces on the cartilages of each patella; these clots were maintained in their situation by a thin transparent membrane perfectly smooth and polished, and at its margins bevelled off, gradually disappearing upon the polished surface of the cartilage, but the clots and their membranes were easily removed; the cartilage was blood-stained, and in various places presented a fibrous appearance, with deep clefts leading down to the bone. There was no increased vascularity about the joints, neither did they contain a larger quantity of synovia than usual.

Having thus proved that a membrane presenting the characters of a serous tissue, is formed from

blood extravasated, I shall now bring forward some cases of a newly-formed membrane being produced from the blood in the vessels themselves, and that too without any apparent signs of inflammation. The production of this membrane may take place either on the coats of the vessels or on the surfaces of clots contained in the vessels.

In June 1844, I examined an aneurismal pouch about the size of a large walnut, situated a little above the aortic valves. The arterial opening of this pouch, which was a free one, presented a thick, elevated ridge, deeply serrated and of a yellow colour, whilst its walls were remarkably thin and without a trace of yellow tissue; its internal surface was lined throughout by a fine transparent membrane, perfectly smooth and polished on its free surface, except at a few points where some small fibrinous coagula were adhering to it. This membrane and the lining membrane of the artery were, throughout the whole circumference of the aneurismal opening, perfectly continuous, and so beautifully adapted to each other, that, to the naked eye, they appeared to be identically of the same character.

In the preceding case it appears to me that the internal and middle coats of the artery had been destroyed, and that the pouch was formed by the cellular coat lined with a membrane which owed its origin to the fibrine of the blood constantly circulating through this abnormal cavity, and which had subsequently taken on the characters belonging to the serous coat of this vessel.

In June 1844, a man under the care of Mr. Hawkins was attacked with diffuse cellular inflammation of the inferior extremity, terminating in two days in extensive gangrene of the skin. In the superficial and common femoral veins of the affected extremity, I found extensive clots, not completely filling up the veins, but slightly adherent at different points, to their internal coats. These clots still retained in some places the colouring matter of the blood, whilst at others the colourless fibrine alone remained ; in both the veins the clots were enveloped in a perfectly distinct, transparent, smooth, and polished membrane, presenting the appearance of a serous tissue. In the structure of these membranes were several distinct arborescent vessels, minutely injected ; some of these vessels were of sufficient size to allow of the blood being made, by gentle pressure, to circulate through them : but no communication could be traced between these vessels and the coats of the veins. The membranes were easily peeled off from the surfaces of the clots with which they were in contact. The internal coats of the veins presented their natural colour, and polished surfaces, except at the points where the slight adhesions above-mentioned existed. The internal saphenic contained dark-coloured coagula, presenting the appearances of the blood commonly observed in veins.

In 1841 and 1844, I examined two large aneurisms of the aorta, which had been completely blocked up by fibrinous coagula, of long standing, and about two inches in depth. In each case, the

coagula presented, towards the cavity of the artery, a slightly-cupped surface, which was completely covered over by a fine, transparent, polished membrane, continuous with, and apparently exactly of the same nature as, the lining membrane of the artery. So perfect was the adaptation of these two membranes, that it was impossible, at first sight, to define the exact limits of each of them. After the removal of the coagula, the walls of the pouches were found to be remarkably thin, whilst the margins, at the arterial opening, of the size of a crown piece in one case, were elevated, remarkably thick, deeply serrated, and of a yellow colour.

With regard to these membranes, Mr. Bowman, some short time back, informed me of a curious fact. This gentleman, who has had an opportunity of examining, with the microscope, newly-formed membranes, similar to those described in the preceding cases of aneurism, told me that he has never yet found any epithelial cells on the smooth, polished surfaces of these membranes, although they, to the naked eye, appear to be exactly of the same nature as the membrane which lines the arteries.

The clots in the heart and large vessels of persons who have died a lingering death, sometimes present perfect types of the manner in which the extravasations of blood into serous cavities become encysted.

The upper surface of the clots, in the cavities of the heart, as this organ lies in its natural position, is not unfrequently covered over by a delicate, trans-

parent membrane, of a whitish colour, and perfectly smooth, and polished on its free surface, which may be easily peeled off from the blood, with which it is in contact. I have often observed this coating, even when all the other parts of the coagulum have been of a dark colour, and have traced it, wherever the blood has not been entangled, in the meshes of the fleshy fibres of the heart. In the large vessels, the internal surface of which is throughout perfectly smooth, the clots are oftentimes *completely* enveloped in a thickish membrane, of a character precisely similar to that described above, the other parts of the blood being sometimes of a dark colour, and firmly coagulated, except towards the centre of the clot, where the blood is more fluid. I have often peeled off this membrane, which is formed of coagulated fibrine, and which presents, after having been in water for a short time, exactly the appearance of the membrane, which is found enveloping some of the extravasations of blood in serous cavities.

Even blood extravasated into the tissues, becomes enveloped by a cyst, the formation of which may be, in some cases, traced to the fibrine of the extravasated blood.

In the beginning of 1839, a man was admitted into St. George's Hospital, with a severe injury of the thigh, and extensive extravasation of blood, in the subcutaneous cellular tissue, on the anterior surface of the tibia. After a few days, a great part of the blood over the tibia became collected into a

pouch, the margin of which was hard and circumscribed, the centre being soft and fluctuating. In the course of time, the pouch appeared gradually to contract, and its margins became less and less hard, until at length all traces of the extravasation of blood disappeared, and the parts resumed their natural appearance. All this took place without a single symptom of inflammation about the part; and yet the usual explanation given in such cases, is, that this pouch depends upon an exudation of lymph, poured out from the irritated and inflamed vessels in the neighbourhood. Is it not much more rational to suppose (when there are no symptoms of irritation, much less of inflammation present) that this circumscribing of the blood depends solely upon the fibrine of the blood already extravasated? Extravasations similar to the preceding one are often met with about the scalp, after an injury. In some of these cases, in which the blood has appeared to remain for a long time after the accident, a perfect cyst has been found, containing coagula and blood-tinged serum.

In the ovaries, I have had repeated opportunities of examining extravasations of blood, which are surrounded by a fine, delicate membrane, formed from the fibrine of the effused blood, the tissues in the neighbourhood being neither injected nor discoloured.

The well-known apoplectic cyst owes, I think, its origin, in many cases, to the fibrine of the blood already extravasated into the substance of the brain,

and not, as is commonly supposed, to an exudation of lymph, consequent upon irritation and inflammation of the neighbouring parts. A careful consideration of the various appearances observed in these cerebral apoplectic cysts will at once point out how strongly they resemble, in every point, the cysts which have been described as completely enclosing the extravasations of blood in the cavity of the arachnoid. This resemblance did not fail to attract the notice of Dr. Abercrombie,* who, in speaking of a large collapsed cyst found on the surface of the brain, expressly states that "it exactly resembled the substance which is found lining the apoplectic cysts in the structure of the brain."

Extravasations of blood into the cavity of the arachnoid have been found perfectly circumscribed by a false membrane, presenting all the characters of a serous tissue, six days after the first appearance of the symptoms. I have seen an extravasation of blood into the cavity of the pleura thus circumscribed five days after the accident. If the membrane is, as I suppose it to be in the majority of cases, formed by coagulated fibrine, there is no reason why these extravasations should not be found circumscribed, even at an earlier period; for I have already stated that I have repeatedly found the coagula of the large vessels, twenty-four hours after death, completely encysted in a membranous layer of coagulated fibrine.

* Loc. cit., p. 277.

By whatever process formed, these new membranes, in the cavities of serous tissues or in vessels, are so beautifully adapted to the original serous tissue, that it becomes a matter of the greatest nicety to trace the respective limits of each.

In the cavity of the arachnoid I have generally observed that the false membrane extends far beyond the limits of the pouch containing the blood : sometimes this membrane occupies the whole length of the parietal arachnoid, corresponding to the upper surface of one of the hemispheres, the pouch itself only measuring about the middle third of this space ; in these cases the walls of the pouch are often one or two lines in thickness, the other parts of the membrane being pellucid, and gradually lost upon the arachnoid ; these appearances are easily explained by the gradual addition of fibrine to the walls of the pouch, from the blood contained in its cavity.

Source of the hæmorrhage.—In speaking of exhalations of blood into serous cavities, Dr. Hodgkin states, “ I know of no instance of the arachnoid containing blood, except from apoplexy, or injuries of the head ;” but, at the present time, there are already on record many cases in which the hæmorrhage was not attributable to either of these causes, and recent investigations have, moreover, led many anatomists to the conclusion that exhalations of blood are found much more frequently in the arachnoid than in any other serous membrane. Mr. Ernest Boudet* states that, at the Salpêtrière, six

* Loc. cit., p. 22.

of these cases were met with in seven months, and Mr. N. G. de Mussy met with eight of them in one year at the same Hospital ; all these cases occurred in elderly persons. Several cases occurring in children have also been placed upon record by Messrs. Rilliet et Barthez.*

I have made use of the term "exhalation," as it is commonly used by the profession, both in England and on the Continent, to explain those cases in which the source of the hæmorrhage has remained undiscovered, however minute may have been the examination ; but I agree with those anatomists who think that, in these so-called exhalations, the red blood disks always proceed from ruptured vessels, for the most part so minute as not to be discovered by our usual means of investigation. The extravasation, in these cases, generally takes place very slowly, and the blood is poured out in small quantities ; sometimes the extravasation is intermittent, so that layers of coagulated blood, of various hues, have been found in contact with each other in the cavity of the arachnoid. The quantities of blood found in the cavity of this serous membrane, under these circumstances, have been very large ; in Rostan's 91st case, already quoted, the cavity of the arachnoid contained more than two tumblers full of blood, with large dark clots.

These extravasations in the arachnoid are generally met with in cases where there has been a decided determination of blood to the head, by what-

* *Traité des Maladies des Enfants*, vol. ii. 1843.

soever cause produced. I have met with them in cases where there has been great anxiety of the mind, in poisoning by opium, in drunkards, in delirium accompanying phthisis, in maniacal patients, and in aged people, in whom I think that these effusions depend oftentimes upon the atheromatous deposit in the arteries of the brain and its membranes, which so frequently gives rise to extravasations of blood into the substance of that organ.

I shall avoid troubling the Society with a minute detail of the many symptoms which have been found to accompany these extravasations of blood into the cavity of the arachnoid ; symptoms, which it is obvious must vary according to circumstances ; such as, the greater or lesser quantity of blood extravasated ; the rapidity with which the fluid is poured out, its situation, and its being spread out upon the surface of the brain, or accumulated in a cyst, &c., a due consideration of which circumstances will point out how hopeless must be, in most cases, any attempt at a correct diagnosis ; and thus it is, that we find it stated by different authors that the cases of this nature which they have had an opportunity of watching, have borne the closest resemblance to diseases of the brain of totally opposite characters.

Connected with these extravasations there is however one remarkable circumstance, which having been already observed in several cases, ought not I think to pass unnoticed. I allude to an intermission in the symptoms either of coma, or even of paralysis. This intermission occurs under different circum-

stances : it may be dependent upon an interruption in the pouring out of the blood, during which time the brain gets accustomed to the pressure, and recovers its functions, until a further extravasation takes place : if carefully examined, the extravasated blood will in these cases be found of different hues, some of it being of a rusty colour, and other parts of the colour of recently-effused blood. This intermission in the symptoms also occurs in those cases where the extravasated blood has been completely surrounded by a perfectly organized cyst, such as in Case 5, in which the symptoms both of coma and of paralysis were observed to vary considerably: this is easily explained by the organization of the cyst, which, by pouring out a fresh quantity of blood or serum into its cavity, may produce symptoms of compression, which will vary according to the more or less rapid absorption of the fluid.