A SHORT ESSAY

ON

ACCIDENTAL HAEMORRHAGE

Submitted for the Gunning (Victoria Jubilee) Prize
in Obstetrics

- by -

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Pathology.
TYPES OF ACCIDENTAL HAEMORRHAGE.

Apparent accidental Haemorrhage.
(From Beck's Obstetrical Practice).

Absolutely concealed accidental Haemorrhage.
(Beck).
ACCIDENTAL HAEMORRHAGE.

Introduction.

The term "accidental haemorrhage" is used to describe the bleeding that occurs from the premature detachment of a normally situated placenta during the last three months of pregnancy. Synonymous terms such as ablatio placentae, abruptio placentae and premature separation of the placenta are frequently used to denote this condition. Several varieties of accidental haemorrhage are described and the different types are well illustrated in the accompanying series of diagrams reproduced from Beck's text-book on "Obstetrical Practice."

Varieties.

External Accidental Haemorrhage.
(Synonyms: Apparent or revealed.) In this type blood escaping from the partially separated placenta tracks down between the membranes and uterine wall and ultimately reaches the exterior.

Concealed Accidental Haemorrhage.
(Synonym: Internal). In this type the blood remains entirely within the uterus and fails to reach the exterior. Firstly, haemorrhage may be localised behind the placenta, thus forming a retro-placental haematoma; secondly, the blood may escape from the placental site and rupture through the membranes into
TYPES OF ACCIDENTAL HAEMORRHAGE.

Relatively Concealed Accidental Haemorrhage. (Beck).

Relatively concealed accidental Haemorrhage. (Beck).
into the amniotic cavity; thirdly, the blood may escape from the placental site and separate the membranes from the uterine wall as far as the internal os, where, owing to either the ball-valve action of the presenting part or the firm attachment of the membranes, escape of the blood to the exterior is prevented.

**Combined Accidental Haemorrhage.**

(Synonyms: Mixed or external and internal)

As the term indicates this type is a combination of the external and internal varieties of accidental haemorrhage. Some of the blood finds its way to the exterior while a varying amount remains dammed up within the uterine cavity.

**Incidence:**

Of the three main varieties of accidental haemorrhage, the external type is, fortunately, by far the most common. The amount of haemorrhage, of course, varies in the individual case but as shock is seldom a prominent feature treatment along conservative obstetrical lines with blood transfusion, if necessary, is in the large majority of cases sufficient to control the haemorrhage and render the prognosis favourable. The concealed variety, however, presents a completely different picture, for here we have shock, at times profound, and often toxaemia, superimposed upon an internal haemorrhage. Fortunately, comparatively few cases of this type are seen, as the
prognosis is far from favourable. In the combined variety the gravity of the case will depend upon the gravity of the concealed element present rather than upon the amount of external bleeding.

Some idea of the comparative incidence of the different varieties of accidental haemorrhage may be obtained from a perusal of the records of the Royal Maternity Hospital. During the twelve years, 1923-34 inclusive:

471 cases were labelled external.
59 " " mixed.
40 " " concealed.

Five deaths occurred in the series of 471 cases of external accidental haemorrhage, giving a maternal mortality of 1.1%. Nine deaths are included in the second group of mixed accidental haemorrhage—a maternal mortality rate of 15.3%. The high figure in this group is probably due to the fact that cases are included which, although presenting the typical picture of a severe concealed accidental haemorrhage, show some degree of external bleeding. The number of deaths recorded in the third group of concealed accidental haemorrhage is six, giving a mortality rate of 15%. In the whole series of 570 cases of accidental haemorrhage the maternal mortality rate was 3.5%.

The part played by accidental haemorrhage in the total maternal mortality rate had been quoted in the "Report on Maternal Morbidity and Mortality in Scotland" as 2.4% and in the "Final Report of Departmental Committee on Maternal Mortality and Morbidity" as 3.5% of the total deaths.
Etiology of Accidental Haemorrhage.

Various hypotheses have been put forward from time to time to explain the causation of accidental haemorrhage. Some of these will now be considered.

(1). Towards the end of last century and during the beginning of this century it was held that traction of the foetus on the placenta by means of a short cord might cause separation of the placenta. The coloured plate in Pinard's atlas (No.28) is an excellent picture of accidental haemorrhage, explained on the basis of a short cord. As Essen-Moeller points out in this case, rupture of the membranes, internal version, and other obstetrical manoeuvres were carried out without difficulty and it is, therefore, difficult to understand why Pinard explained the case thus. No actual cord measurement was made. It has also been pointed out that traction of the cord when the foetus is in utero results not in separation of the placenta but rather in tearing of the cord. A short cord is a well accepted cause of dystocia but it is never a cause of accidental haemorrhage.

(2). Trauma. It is an established fact that trauma may occasionally cause placental detachment and consequent haemorrhage. This was thought by the earlier authors to be an important cause of haemorrhage and, in fact, led to the term 'accidental' being applied to this type of haemorrhage. Essen-Moeller
thought that it might play a certain small part, approximately 5%, in the series of cases which he presented in 1913. Holmes estimated its occurrence as about one-third of his cases. Ley does not believe that any of his cases were due to trauma.

Of more recent investigators, Polak (1930) believes that trauma plays a very definite part in the causation of some cases of accidental haemorrhage. He states that his figures show that amongst the working classes the majority of cases were admitted on Saturdays, with a frequent history of trauma received from drunken husbands, and on Mondays, with a history of injury sustained at the wash tub. Furthermore, he showed a rise in the admission curve corresponding to the summer excursion season when jostling accidents are common.

Alarming placental haemorrhage may be caused by the introduction of gum-elastic bougies in the induction of labour and occasionally placental haemorrhage has occurred following external version.

It may, therefore, be concluded that some cases of placental separation may be determined by traumatism. In these cases the bleeding is usually external and there is never a well-developed uterine apoplexy.

(3). **Nervous Influences.** Such emotional disturbances as severe fright or extreme anxiety have for long been considered as possible etiological factors in abortion and have also been held as a cause in
accidental haemorrhage. Rigby states that it may occur but there is little support for this theory.

(4) Decidual Endometritis. This has now ceased to be regarded as in any way responsible for the condition of accidental haemorrhage.

Syphilis has not even a predisposing influence. It was noted in three out of thirty-seven cases of Williams, a percentage lower than that of the normal average incidence - 10% at his clinic. Ley found one positive Wassermann in fifteen cases where this test was carried out.

Infection plays no part in the production of accidental haemorrhage.

(5) Mechanical Theories.

(a) It was suggested at one time that the appearances in uterine apoplexy were due simply to rupture of the vessels caused by the sudden enlargement of the uterus due to accumulating blood. Experimental evidence has been advanced by Morse to disprove this theory. Large amounts of fluid pumped into the uteri of animals failed to produce any rupture of the blood vessels.

(b) Torsion of the uterus as a cause of accidental haemorrhage has been advanced by several authors, including Polak (1926), who has described the really only convincing case of torsion of the causing accidental haemorrhage. It might be concluded that very occasionally such an accident might produce premature separation of the placenta.
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Toxaemia of Pregnancy. Chantreuil was the first to point out the association of accidental haemorrhage and albuminuria. Since then numerous writers have recorded a certain percentage of cases showing albumen in the urine.

**Albuminuria and Accidental Haemorrhage.**

This was noted in 86% of cases collected by Willson, in 84% of those collected by Ley, and in 91.3% of Portes series. McGee found slightly over 50% of his cases to have albuminuria.

Others have found varying percentages of cases where there have been other symptoms of toxaemia, such as raised blood pressure and oedema. Many cases have been described where there has been an association with eclampsia - 8.7% of all cases according to Willson.

Apart from this association with albuminuria and other toxic symptoms, there is further evidence, to show that accidental haemorrhage is in the nature of a toxic process, in those cases which reveal at post-mortem examination some hepatic damage and even 'eclamptic' lesions.

The pathology of accidental haemorrhage makes it clear that there is some vascular poison acting on the blood vessels causing the endothelial damage and thrombosis with consequent haemorrhages. The whole of the pathology of the toxaemias is dependent on endothelial damage. The liver necrosis, cerebral
haemorrhages, glomerular lesions, severe damage of cortical necrosis, the uterine haemorrhages of accidental haemorrhage - all of these are evidences of some powerful endothelial poison.

In accidental haemorrhage, therefore, it would appear that the lesions are directly due to some substance which, acting on the thin walled decidual sinuses, initiates the placental haemorrhage. In more severe cases this poison also damages the other uterine veins and smaller vessels. The reason why symptoms of toxaemia are not present in all cases of accidental haemorrhage was explained by James Young, who, believing that toxaemia was due to toxic absorption from placental infarcts, stated that in many cases the placental separation caused labour to commence before these symptoms could appear following absorption from the diseased placenta. He believed, therefore, that in cases where toxaemia and accidental haemorrhage co-existed, the toxaemia was secondary to the accidental haemorrhage and not casual. The fact that the worst cases of accidental haemorrhage usually have complete detachment of the placenta and yet exhibit marked symptoms of toxaemia would appear to contradict this theory which is no longer upheld.

Accidental haemorrhage has been noted as frequently recurring in further pregnancies, and Young has shown that in some cases accidental haemorrhage may constitute evidence of toxaemia in a series
of recurrent toxaemic pregnancies which include such manifestations as eclampsia and stillbirth.

(7) Nephritis complicating Pregnancy. Winter was the first writer to draw attention to this association. From a perusal of the literature there seems to be little clinical evidence to show that accidental haemorrhage and nephritis are associated to any great extent. In his paper on experimental accidental haemorrhage Browne brings out very little clinical evidence that nephritis is the main factor of accidental haemorrhage. Furthermore, he believes that chronic nephritis is only one factor and that there is another toxic factor at work as well.

Kellog (1928), in twenty-nine thoroughly investigated cases, was only able to say that it was possible that four of these 'might turn out to be nephritis.' That accidental haemorrhage occurs in nephritics is an established fact and is probably a predisposing cause in some severe cases but whether it occurs with such frequency as to make it the most important predisposing cause is quite a different matter and requires proof.

It is stated in the 'Report on Maternal Morbidity and Mortality in Scotland' that in sixty-two deaths due to accidental haemorrhage in forty seven, or 75%, there was a history of chronic renal disease or albuminuria.

Wallich (1913) investigated the possibility of high blood pressure as the cause of accidental
haemorrhage. He injected the maternal vessels with fluid at a pressure equal to 200 mm. of Hg., and found that he could easily rupture the maternal blood sinuses of the decidua by this method. He concluded that high blood pressure itself might cause placental separation. Williams reported a fatal case where a severe uterine apoplexy occurred in the absence of any albuminuria in a patient who was under treatment for some years with essential hypertension. Siegel (1933) reported two cases of accidental haemorrhage occurring in hypertensives.

To summarise the possible etiological factors in the causation of accidental haemorrhage, it can be concluded that some cases may be due to trauma, very occasionally to torsion of the uterus, while a very definite group are associated with toxaemia of pregnancy and to a lesser extent with nephritis. A large group of cases has no known cause.
(1) Description of Eight Fatal Cases of Accidental Haemorrhage.

The literature on the subject of accidental haemorrhage contains many full reports on the anatomy of the condition, but by far the greater number are very inadequate in complete post-mortem descriptions. Many observers have concentrated on the changes in the uterus and have paid little attention to the other organs.

The Morbid Anatomy of eight cases of Accidental Haemorrhage will now be described. In five cases complete post-mortem records were available while in the remaining three cases many details were lacking. The second group has been included as in these cases a study of the renal pathology has been possible.

Each case will be preceded by a very short clinical summary.

The material for histological examination was prepared as follows. Each kidney was stained by haematoxylin and eosin for general features and by the azan method for fibrous tissue and basement membranes. For the fat content the original pathological descriptions were used. The uterine muscle was stained also by haematoxylin and eosin and also
by Weigert van Geison and Werlhof's stain to bring out the fibrous tissue and elastic tissue content. Unfortunately no specimen could be obtained of the tissue stained for fat.

The other organs were examined by sections stained with haemotoxylin and eosin.

In one case a whole block section was made of the uterus.

On admission patient was exceedingly ill. She was emaciated and had severe all over hunger. Examination showed that the membranes had ruptured. The uterus was very tender and especially over the right side of the uterus was this pain severe. Bleeding had stopped. Patient was treated with intravenous infusion of fluid, but failed to rally and was undelivered.
Case I. R.M.H. 695/32.

Para. 7.

Details of the previous pregnancies were not obtained except that all seven had been spontaneous and without any trouble. No fits with any previous pregnancy.

Patient was admitted to hospital about a week from term with the following history. During the afternoon of the previous day she had had a little vaginal bleeding and slight pains in the back. Later in the day she found the bleeding to be a little worse and went to bed. She awoke in the middle of the night with intense abdominal pain and found herself in a pool of blood. She had been attending the ante-natal department for several weeks for treatment for a raised blood pressure and albuminuria. (B.P. 150/110. Albumin. tr.).

On admission patient was exceedingly ill. She was exsanguinated and had severe air hunger. Examination showed that the membranes had ruptured. The uterus was very tender and especially over the right side of the uterus was this pain severe. Bleeding had stopped. Patient was treated with intravenous infusion of fluid, but failed to rally and died undelivered.
POST MORTEM REPORT (Carried out on day of death).

There was some slight oedema of the ankles.

Skin pallid.

**Circulatory System.**

Heart was of normal size. No hypertrophy.

**Lungs and Pleurae.**

Quite healthy.

**Alimentary System.**

Pancreas, spleen, etc., all normal.

**The Liver.**

This was of average size but very pale in colour. Sections stained for fat showed that there was fairly extensive fatty degeneration, the cells nearest the hepatic veins being most affected. There was no necrosis of any of the liver cells.

**The Uterus.**

The uterus was of normal size for the period of gestation. In the region of the right cornu there was an area about the size of a saucer where the peritoneum was raised by numerous haemorrhages. This whole area was raised above that of the rest of the uterus. On incising the uterus, it was found that this area overlay to some extent the original placental insertion. The placenta was partially separated off by a large amount of black blood clot. This
Case 1. Shows haemorrhage and oedema in the myometrium and in the decidua immediately underlying it.
spreading down had stripped off the membranes. There was no free fluid in the peritoneal cavity. No broad ligament haematoma. No ante-mortem thrombosis in any veins.

**Histology of Haemorrhagic area of the uterine wall.**

The main change which strikes one is the wide separation of the muscle fibres by oedematous fluid. This is especially noted in the outer half of the muscle thickness. Through the oedematous interfas-cicular fluid, fine fibrils of connective tissue cells extend. Here and there and in an irregular fashion these spaces are filled with blood which tends to spread along the length of the muscle bundles. There is nowhere any suggestion that the fibres have been actually ruptured by the haemorrhage. The few vessels included in this section are seen to be perfectly healthy. There is no indication of venous thrombosis. Although fat stained sections are not available, there is no obvious abnormality of the muscle cells themselves.

**The Kidneys.**

These on naked eye examination presented no abnormality. The capsule stripped easily. The cortex was well defined. The kidney was rather pale.

**Histological Examination of Kidney.**

The Glomeruli. These were in general quite healthy in appearance. A few showed dilated
Capillaries: mostly, however, they were of normal shape and size.

**The Tubules.** Considering that the post-mortem was carried out so soon after death, these showed quite pronounced changes. They exhibited intense cloudy swelling and in some areas necrosis.

**The Interstitial Tissue** was perfectly normal.

**The Vessels.** These were in the main healthy. Here and there, however, a few showed marked thickening and one or two glomeruli were seen to be fibrosed.

**Summary.**

Accidental haemorrhage, concealed and revealed.

Uterus showed typical features of this condition.

No pathology in the liver or the kidneys.
Case II. R.M.H. 355/33.

Para...7. Aged 42. All previous pregnancies had been normal.

Patient was about 32 weeks pregnant when she was admitted to hospital with the following story.

About four hours before admission she had been awakened from her sleep with intense abdominal pain. She discovered also that she was bleeding. The pain was continuous and incessant. She could get no relief from it. Patient was admitted to hospital forthwith.

Examination on admission showed that she was exceedingly ill. Profound exsanguination was present, with its accompanying air hunger. The pulse was 120 and very weak. The blood pressure was 140/100 and there was a little albumin in the urine.

A blood transfusion was performed and later, when she rallied somewhat, a Caesarian Section under local anaesthesia was carried out. The appearances will be described later.

Patient made an uninterrupted recovery from the operation but developed a complete anuria. She was transferred to the Royal Infirmary where she died in the course of a few days, having passed no urine.

POST MORTEM (Carried out on the day of death).

Circulatory System

The heart showed some slight left ventricular hypertrophy.
The Lungs and Pleurae.
These showed terminal congestion and oedema.

The Abdominal Cavity.
Nil to note in the intestines, stomach or spleen.

The Liver.
This was of normal size and consistency. Microscopically the liver showed a certain amount of atrophy of the cells around the central lobular vein, but there was little or no actual necrosis of the cells.

The Kidneys.
These had the typical naked eye appearances of bilateral cortical necrosis. Thus the cortex was converted into a broad bright yellow band which contrasted strangely with the rather congested medulla.

Histological Appearances.
In the haematoxylin stained section the cortex has the typical ground glass appearance which is characteristic of cortical necrosis. But with the Azan stained section, several important points emerge.

The Glomeruli. These show the typical thrombosis of the afferent glomerular vessels. There is a great increase in the thickness of the basement membrane of the tuft capillaries, but this is seen in all cases of cortical necrosis and is of doubtful significance as far as evidence of nephritis is
concerned. However, there are many glomeruli which have been converted into fibrous whorls.

The Tubules. These are entirely necrotic, but there are many groups of dilated tubules.

The Interstitial Tissue. There is a definite increase in the connective tissue.

The Vessels. A large number but by no means all of the medium sized vessels show a very marked endarteritis obliterans, and in some cases the lumen is reduced to a mere chink.

The appearances suggest that the kidneys had been involved in general vascular disease quite apart from the cortical necrosis. There is no evidence, however, of any previous glomerulo-nephritis.

The Uterus.

At operation this was seen to be a classic example of the condition of uterine apoplexy. The whole uterus was of a bluish red colour, with bright red splashes of haemorrhage here and there. Sub-peritoneal haemorrhages were very marked at the region of the cornua and also on the posterior wall. There were large haematomata in both broad ligaments. There were no fissures in the peritoneum, but there was a quantity of blood stained fluid in the peritoneal cavity. On incising the uterus there was comparatively little fresh bleeding. Large black clots were removed and also a completely detached placenta. This showed no obvious infarcts to the naked eye and
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was not examined histologically.

**Histological Examination of the Uterine Muscle.**

The muscle fasciculi are separated by cedematous fluid. Within this fluid are the elongated filaments of the fibroblastic processes. Numerous haemorrhages can be observed separating the muscle in the direction of their fibres; none of them have been torn across. The vessels are normal and one or two medium sized vessels show the characteristic appearance of the multigravida. The muscle coat is thick and there is a considerable deposit of elastic tissue around it. The peritoneum has been lifted up by haemorrhages in several areas. The muscle cells have been poorly preserved and no opinion can be offered of their condition.

**Summary.**

Classical concealed accidental haemorrhage.

Bilateral cortical necrosis of the kidneys.

Evidence of chronic vascular disease involving the kidneys.

Mrs. Fraser. Para ... 9. Seven of these were spontaneous and at term. One was premature and another miscarriage. No further details available. Patient was about 32 weeks advanced in her pregnancy.

History.

Pregnancy had been quite normal until the morning of admission. She began to complain of pains and soon after there was a little bleeding. She was seen by a student who diagnosed a 'show' and said he would return later. Eventually the patient was admitted to hospital, having lost a great deal of blood and in an exsanguinated condition.

The fundus was at a point three fingers below the ensiform cartilage and the whole uterus was very tender. Pains were occurring and there was still a little spurring of blood. The vagina was packed. Re-packing was needed on three other occasions, and in spite of intravenous fluid the patient died, undelivered.

POST MORTEM. Carried out on day of death.

Circulatory System.

The heart was small and showed a few fresh warty vegetations on the mitral valve.

Alimentary System.

The teeth were in a very aseptic condition
Respiratory System.

There was a mild bronchitis present.

The Liver.

This was of average size. The cut surface was very pale and there were no haemorrhages in the organ. Microscopically nothing was to be noticed except for some cloudy swelling of the liver cells.

The Uterus.

The serous surface was covered with numerous sub-peritoneal haemorrhages. These were especially well marked over the posterior surface. There was a small amount of blood stained fluid in the peritoneal cavity. There were no broad ligament haematoma nor ovarian haemorrhages. On opening the uterus, the placenta was found to be situated over the posterior wall at the fundus and was almost completely separated from the uterine wall by a retro-placental haematoma. When this was washed off, it was noted that there was no naked eye evidence of infarction.

Microscopically.

There are numerous haemorrhages amongst the muscle fibres principally confined to the area near the perimetrium. These are not large haemorrhages but separate the muscle fibres in the length of the fibres. In this area numerous thrombosed veins can be seen. In one area a fairly large extravasation of blood can be seen around such a vessel. Two medium sized arteries are included in the section. They show no
Case 3. This section shows very well the typical oedema which occurs in marked cases. Haemorrhages can also be seen.
abnormality but are typical of a multipara in that they are relatively thick and have a considerable deposit of elastic tissue around them. The muscle fibres themselves appear to be normal. They are, however, throughout the section separated in small bundles by oedematous fluid which contains a certain number of connective tissue cells.

The Kidneys.

Naked eye, these were somewhat pale, but no showed gross abnormality. On Microscopical examination, the following features were observed.

The Glomeruli. The tufts are very large and entirely fill the capsular space and in many cases pout into the efferent tubule. They are very cellular and relatively avascular. The azan stain shows a very great increase in the basement membrane. In many instances the tuft is adherent to the Bowman's capsule which is also thickened.

The Tubules are relatively unaffected.

The interstitial tissue shows a slight increase and the vessels are normal. The picture is that of an acute glomerulo-nephritis passing off into the subacute phase.

Summary.

Accidental Haemorrhage, concealed and revealed.

Subacute Nephritis.
Case IV. 93/29.

Admitted to the Maternity Hospital on 14.1.29.


During the week before admission, patient had been feeling unwell and had noticed some swelling of her feet. On the afternoon of the day of admission she had a sudden severe pain in the abdomen, felt faint and went to bed. She was later admitted to hospital.

On admission the urine was found to be solid with albumin and the blood pressure was 156/110. Patient was extremely shocked and there was a slight blood stained discharge from the vagina. The legs and face were oedematous. Caesarian section was carried out. The uterus presented the usual features of concealed accidental haemorrhage. It was purple in colour and exhibited numerous haemorrhages under the peritoneum, especially near the fundus. There was a large haematoma in one broad ligament. Blood stained fluid was present in the abdomen. A still born foetus was removed, together with a completely separated placenta. The patient died immediately after the operation.

POST MORTEM. This was carried out the following day.
Case 4. On one side of this area an intact capillary surrounded by haemorrhage can be seen. On the other there is the typical separation of the muscle bundles by oedema.
The Liver.

This was not enlarged and there was a solitary subcapsular haemorrhage at one point. On microscopical examination there were patchy areas of necrosis of the liver cells, but these were not at all extensive.

The Uterus.

The naked eye features have already been described.

Microscopically.

The muscle fasciculi are separated in all areas by oedematous fluid in which can be seen a few connective tissue cells. Processes of these cells can be seen interlacing amongst the oedematous fluid. In some areas, notably just below the perimetrium, the muscle fibres are separated by haemorrhages which extend parallel to them. The vessels which appear in the section are all perfectly normal. There are no thrombosed veins to be seen.

The Kidneys.

On naked eye examination, these did not show any great change, being normal in size and shape. They were pale in colour.

Microscopical Examination.

The Glomeruli. These were all perfectly healthy. No suggestion of any increase in thickness in Bowman's capsule. There was some slight increase in nuclei of the tuft and possibly of the basement
The Tubules. These showed extreme degenerative (? post-mortem) changes.

The vessels and the interstitial tissue were perfectly healthy.

Summary.
Concealed accidental haemorrhage.
Death probably from shock.

The Liver.

Macroscopic. The organ was of normal size and rather pale. There were no obvious haemorrhages.

Microscopic. The liver showed many small areas of necrosis. The cells in these areas had lost their outlines and were greatly swollen and vacuolated. These areas of necrosis were to be found at all parts of the liver lobule. They were typical of the 'ascustomed' liver.
Case V. 9/34.

Aet. 19. Primigravid.

The last menstrual period was March 1934. Patient was admitted to hospital on 11.12.34 with the history of severe abdominal pain and some vaginal bleeding. On examination the abdomen was very tender and the uterus was hard. There was some vaginal bleeding. The presentation was a vertex. There was albumin in the urine and the blood pressure was considerably elevated. There was also marked oedema of the feet and slight oedema of the face. The membranes were ruptured and pituitrin administered. Patient went into labour and a live child was delivered with the aid of forceps. Following this for three days patient had complete anuria, after which death took place.

POST MORTEM.

The Liver.

Naked Eye. The organ was of normal size and rather pale. There were no obvious haemorrhages.

Microscopic. The liver showed many small areas of necrosis. The cells in these areas had lost their outline and were greatly swollen and necrotic. These areas of necrosis were to be found at all parts of the liver lobule. They were typical of the 'eclamptic' liver.
The Kidneys.

Naked Eye. The kidneys were enlarged and pale and the capsule stripped easily. They were typical of the so-called 'large white kidney'. The cut surface did not bleed. The renal pelvis was normal.

Microscopical Examination.

The Glomeruli. These were for the most part greatly enlarged. There was a very marked degree of increase in the nuclei. The capillary lumina were closed by swollen endothelial cells and the tufts were consequently completely avascular. There was a great increase of the capillary basement membrane and the appearance in the azan slide was most striking. There was some slight thickening in the basement membrane of Bowman's capsule.

The Tubules. These were relatively unaffected. The lumina were filled with granular detritus, but the cells only exhibited the appearances of cloudy swelling.

The Vessels. These were quite healthy and in no way thickened.

The Interstitial Tissue. This was very definitely oedematous. In some areas there was a very definite increase of fibrous tissue and associated with these areas were some dilated tubules.

The appearances of the kidneys, therefore, were those of a healing acute glomerulo-nephritis.
Case 5. A high power view of the myometrium. Note the great amount of young connective tissue.

Case 5. A low power view of a section stained for fibrous tissue. (dark).
The Uterus.

The specimen is a most beautiful example of accidental haemorrhage.

Three colours are seen on the surface of the uterus - pale yellow, bright red and deep blue. The yellow colour represents the normal uterine muscle, the red the areas of haemorrhage and the blue the more cyanotic areas and veins.

The haemorrhages are to be seen all over the specimen but are chiefly located in the fundal region especially on either side. They are not particularly large and merge gradually into the normal tissues. On either side the broad ligament is prominently seen. This is due to the fact that each contains a large haematoma. The ovaries are quite normal.

The surface seen by cutting the uterus longitudinally is also striking. On the fundal region large thrombosed vessels stand out with great clearness from the normal appearing muscle. The peritoneal haemorrhages are seen to be quite superficial. The cavity is filled with clot. The cervical region is represented by a uniform dark red area.

The Microscopic Examination. (A whole block section was examined).

The Fundal area. Underneath the peritoneum can be seen a few typical haemorrhages. These are not large and separate the muscle fasciculi in
Case 5. Note the thrombosed veins, the strands of fibrous tissue, the haemorrhage and the absence of oedema.

Case 5. A Section through the broad ligament. Note the widespread extravasation of blood.
their length. Apart from these small extravasations, there are no other haemorrhages in this area. The most striking vascular change is in the large veins. These are all completely thrombosed. Even the smaller veins are thrombosed completely. There are no very large arteries to be seen, but the medium sized arteries are perfectly normal and rather empty of blood.

The muscle itself is normal, but a very striking thing is to be noticed. Throughout the whole specimen the muscle is separated by strands of very young vascular connective tissue. Here are seen many young fibroblasts which here and there condense to form a capillary. This connective tissue is compact and not oedematous. It is all-pervading and in some areas only a few muscle cells can be seen in a mass of this young tissue.

The Lower Uterine Segment. This presents precisely the same features.

The Cervix. This appears to have been severely traumatised, as there is a very considerable extravasation of blood throughout the tissue. The typical hyperplastic cervical epithelium can be seen.

The Broad Ligament. A section shows the broad ligament to be occupied by a haemorrhagic extravasation separating the various vessels and nerves.

Summary.

Acute Nephritis.

Concealed accidental haemorrhage.
The following three cases are incomplete in that no portion of the uterine wall was kept for detailed examination.


Patient was 36 weeks advanced in her second pregnancy, the first pregnancy having been quite normal. She was admitted to hospital with the history that eight hours or so before admission she had commenced to have vaginal bleeding.

On examination under an anaesthetic, no placenta praevia was found and the membranes were ruptured. Urine taken off at this time was heavily laden with albumin (++++) and the blood pressure was 140/100. Delivery was accomplished without difficulty.

The placenta was heavily infarcted and had some old black clot adherent to it.

Following this the patient had complete anuria for four days and partial anuria for another four days, at the end of which time she died.

POST MORTEM EXAMINATION.

Apart from some hypostatic congestion of the lungs, the only features of importance are the liver and the kidneys.

The Liver.

This was normal in shape and slightly diminished in size. On section no haemorrhages were noted.
Microscopical examination showed that there was a considerable degree of fatty degeneration.

The Kidneys.

These, on naked eye examination, showed the classic features of bilateral cortical necrosis. The whole cortex was converted into a broad yellowish area.

Microscopical Examination.

Very careful examination with azan and elastic tissue staining fails to reveal the slightest indication of previous renal damage. The features are those of bilateral cortical necrosis.

Diagnosis.

Accidental Haemorrhage.

Bilateral Cortical Necrosis of the kidneys.
Case VII. 1801/1927. R.M.H.


Admitted on 21.1.27, with the following history.

Of her four pregnancies, only one resulted in a living foetus. The three following this were all still born.

Since the second month of the present pregnancy, patient had had some swelling of the legs and on admission this was well marked in the legs, arms and face. Apart from this she felt quite well until one week ago, when she had trouble in seeing things clearly. Vaginal bleeding had commenced some six hours before admission and was rather severe. The blood pressure was 160/95. The patient was anaesthetised, the membranes ruptured and the vagina packed. Later a leg was brought down and labour easily accomplished. The placenta showed a large number of infarcts and was covered with black clot. There was a succenturiate lobe.

Patient from now on had what virtually amounted to a complete anuria and died eleven days after delivery.

POST MORTEM. Performed on day of death.

The Liver

This was small and pale but contained numerous subcapsular haemorrhages. On microscopic
examination, there was well marked necrosis of the liver cells in the central parts of the lobules. There was extensive fatty infiltration and degeneration of the liver cells.

The Uterus.

This is noted as having been six inches long and showing numerous congested and haemorrhagic areas on the posterior wall. There was a cupful of brown stained fluid in the peritoneal cavity.

The Kidneys.

These showed again the typical features of bilateral cortical necrosis, namely, necrotic cortex with numerous thrombosed vessels. There is no evidence of any chronic renal or vascular change such as obliteration of glomeruli or vessels.

Diagnosis.

Accidental Haemorrhage.

Cortical Necrosis of the Kidneys.
Case VIII. 767/26.

Admitted to the R.M.H. 22.5.26.

Para... 5. Aet 27. About 32 weeks pregnant. On the morning of admission, patient was seized quite suddenly with severe upper abdominal pain. Shortly after this there was some vaginal bleeding which rapidly became severe. She was admitted to hospital some hours later. On admission the blood pressure was 140/90 and there was a plus of albumin in the urine. The upper left fundal region was very tender on palpation. Because of her condition, Caesarian Section was carried out. The uterus was dark red in colour, there was some free blood stained fluid in the abdomen, and in the left cornu there were numerous sub-peritoneal haemorrhages. The placenta was completely separated off from the uterus. The patient eventually died of sepsis some 16 days after the operation.

POST MORTEM.

There are few features to note. There was a generalised peritonitis. The uterine wound had broken down. There was nothing to be noted in any other organ.

The Kidneys.

To the naked eye, these were of normal shape and size, and rather pale on examination.
On Microscopical Examination.

The Tubules. These showed intense cloudy swelling, passing on to frank necrosis.

The Glomeruli. These were quite normal.

The Interstitial Tissue. This was normal in amount.

Summary.

Accidental Haemorrhage.

Peritonitis.
Case of Concealed Accidental Haemorrhage.
(W. Fordyce and R.W. Johnstone).
(2) Description of the Morbid Anatomy of Accidental Haemorrhage.

The Naked Eye appearances of the Uterus and Appendages.

The coloured plate with which Couvelaire (1912) illustrated his paper on accidental haemorrhage probably played a very important part in bringing to the notice of the profession the gross appearances of concealed accidental haemorrhage. Whitridge Williams (1915) also published an excellent plate, and more recently (1920) Johnstone and Fordyce have published a very beautiful, striking, coloured plate illustrating a very severe example of the condition.

When the foetus is in utero, the uterus presents an appearance which is not unlike that of a twisted ovarian tumour of a few days' standing - a point which has led some to believe that twisting or torsion of the uterus plays a significant or even principal role in the production of accidental haemorrhage. The whole organ has a purple appearance, or, in very severe cases, an almost black colour. The whole uterus is streaked and daubed with areas where the colour is of a more reddish hue.

Usually near the fundus, either anteriorly or posteriorly, the whole process is seen to be most severe. In these areas the uterus is seen to be the
Williams' illustration of a case of concealed accidental haemorrhage.

A photograph of a specimen in the Edinburgh Univ. Obstetrical Museum.
seat of numerous frank haemorrhages. These lift up the peritoneal covering into small haematomata. In size they are never very large and are elongated rather than round. In some cases there is a round raised area in the fundal region where the haemorrhages are seen to be very numerous, and occasionally the muscle here is seen to be completely disintegrated or ploughed up. This occurs over what has been the placental site. In a few instances a peculiar ribbed appearance of the muscle has been noted. This is supposed to have been due to rupture of the muscle fibres underneath an intact peritoneum.

In many instances peritoneal ruptures have been noted. They vary in size from six centimeters in length to microscopical rents. These latter are present in nearly all cases. The larger peritoneal ruptures occasionally extend deeply down into the myometrium.

On either side the uterus is flanked by large bunches of veins which consist of those of the uterine wall and also those of the broad ligament. They are invariably greatly distended and in many cases are thrombosed. Frequently the broad ligament is the seat of a large haematoma, as large as an apple. Small broad ligament haemorrhages are a constant feature, however.

The tubes, round ligaments and the ovaries all exhibit on occasion small haemorrhages. Such
Abruptio Placentae Complete. Uterus of the Couvelaire Type. (M.E. Davis).
an appearance is unusual in the ovary, but Couvelaire
(1912) and Whitridge Williams (1915) have both noted
it in their papers.

Even in the most severe cases, the lower
uterine segment does not show any great deal of in-
volvement.

When the foetus has been delivered, the
gross appearances are altered to a certain extent.
The whole uterus contracts to a greater or less de-
gree and the haemorrhagic appearance is greatly in-
tensified and the organ looks gangrenous.

All gradations exist between the severe
types just described and the very mild cases where
at the most only a few subperitoneal haemorrhages can
be seen. A photograph, recently published by M.E.
Davis, shows marked haemorrhagic infiltration beneath
the serosa.

As far as the gross changes are concerned,
the process is limited in the majority of cases to
uterus, tubes and ovaries. There are no convincing
reports of haemorrhages elsewhere of this type. It
has long been known, however, that 'toxic' haemorr-
hages of pregnancy can occur without being associat-
ed with accidental haemorrhage. Shaw has described
a case where a large perineal haematoma was associat-
ed with toxaemic symptoms.

James Young (1909) has described a case
where there was thrombosis of the ovarian plexus, and this has also been noted by a few others.

When the organ is cut, a striking appearance is seen. Underneath the peritoneum the haemorrhages are always more severe. It is to be noted that this is the most constant feature of the morbid anatomy of accidental haemorrhage. The relatively pale uterine muscle is streaked and separated by numerous elongated areas of haemorrhage which run parallel to the direction of the muscle fibres. Sometimes this is replaced by an area which appears to the naked eye to consist of a haematoma. Standing out very distinctly from the cut surface are numerous large vessels which contain thrombi. In one of the cases described (Case V) this was the most striking feature. Ten large thrombosed vessels could be seen in the fundal area alone. Again, it will be noted that on the cut surface the process has hardly affected the lower uterine segment.

There is no pathology to be noted in the cervix. In one of the cases described (Case V.) there was considerable bruising and haemorrhage into the cervix, but this was undoubtedly due to a forceps delivery.
Detailed Description, including Microscopic Anatomy.

Abdominal Free Fluid.

This is noted in every severe case. It varies from a small amount of clear coloured fluid to over a pint of almost pure blood. Usually it exists in the form of a fairly large amount of blood stained fluid. This is due to transudation from a diseased uterus following extensive venous thrombosis, peritoneal ruptures and disintegration of tissues.

The Peritoneal Ruptures.

These vary considerably in size and depth. The cause has not yet been settled. Knauer (1903) attributed them to the sudden severe distension of the uterus which is caused by the placental separation and with the consequent enlargement of the uterus due to accumulated blood. Fraipont (1914) attributed them to the intermuscular haemorrhages, the diminished uterine distensibility and to the friability of the muscle. Against Knauer's contention is the fact that these peritoneal ruptures have frequently been observed where there has not been an entirely concealed haemorrhage but where external bleeding has been quite free. Sudden distension is not likely to cause such rents. It is much more probable that they are merely evidence of the toxic condition of the uterine wall which could be torn in localised areas where the process was more acute. Alternatively some peritoneal ruptures could be caused by a subperitoneal
Haematoma lifting off a small portion of peritoneum and rupturing it when the endothelial cells became necrotic or simply from pressure.

The Uterine Muscle.

The most striking feature of a microscopic section of the wall of the uterus in these cases is, of course, the haemorrhages. The characteristic site of these is in the muscle immediately under the peritoneum and extending into the depth of the myometrium for a greater or lesser distance. They vary greatly in size, the majority being of microscopical dimensions. Williams (1915, 1926) states that they can all be seen to be centred around a small vessel, usually a capillary or a small vein. Browne (1928) illustrates a specimen where he was lucky enough to get a section through a rupture in a small vessel which directly communicated with the surrounding haemorrhage. In some of the specimens described haemorrhages around vessels were observed, but in many cases no direct connection could be observed. However, it is possible for a haemorrhage to completely disintegrate the capillary from which it originated. The larger haemorrhages must obviously come from larger vessels. In general the haemorrhages spread along the direction of the muscle fibres, separating them, and in many cases isolating them. Some observers (Johnstone and Fordyce) noted that these haemorrhages
may also tear through the muscle fibres in a transverse direction, and this has been noted by many others. Ley (1921) also points out that in his specimens the haemorrhages also isolated individual fibres as well as fasciculi.

Haemorrhages in the decidua occur but, as Gordon Ley points out, this is the natural accompaniment of labour and therefore no stress can be laid on this appearance.

There is no doubt that the haemorrhages are much less severe in the inner half of the muscle, with the possible exception of the placental area. The lower uterine segment is less affected.

The second important point to notice is that in all specimens described, and in many cases recorded in the literature, there was a certain amount of oedema amongst the muscle fibres. Williams has pointed out that this is seen in all parts of the uterine wall, irrespective of the situation of the haemorrhages and in fact has nothing to do with these. The oedema separates the muscle bundles just as the haemorrhages do. It is never so extensive as these however. The oedematous fluid stains faintly and because of this Ley refers to it as an albuminous oedema. Another photograph from Davis' recent article shows clearly extensive oedema, haemorrhage and dissociation of uterine musculature. Williams and Hofbauer have
pointed out that in the oedematous fluid many fixed connective tissue cells are present - clasmatocytes as they call them. These are seen in all sections and it is probable that they represent nothing more than the ordinary fibrous tissue cells and endothelial cells which are present normally in the uterine muscle.

The next important point to take up is the muscle cells themselves, which are separated into fasciculi and even isolated cells by the numerous haemorrhages. These isolated cells are thought by some to degenerate very soon. Microscopically they are seen to have lost their distinct outline and the nucleus is only faintly basophilic. Vacuoles are seen in the cytoplasm, and when a fat stain is used these spaces are observed to be occupied by a substance which takes up the stain. Although these appearances are quite natural in such a pathological process, they must to a large extent depend on the time which elapses from the onset of the accidental haemorrhage to the fixation of the specimen. Several authors, including Williams, Coulevaire and Young, have not seen any muscular degeneration. It has been observed by Ley, Johnstone and Fordyce and others. The explanation must obviously lie in the severity of the case and the time which elapses from the onset of the condition to its fixation.

Gordon Ley points out that in his specimens
he was able to demonstrate areas of focal necrosis in the muscle quite apart and entirely separate from those immediately around an area of haemorrhage. He states that there were numerous areas in his specimens where the muscle cells had become faintly staining and the nuclei indistinct and which contained numerous fat filled spaces. These were found in all areas of the upper part of the uteri and more commonly in the inner half of the myometrium. Very few subsequent observers have confirmed this observation. Whitridge Williams in 1926 failed to find them in any of five examples of accidental haemorrhage. Ley also examined several specimens of ruptured uteri. In these cases where the rupture had occurred after trifling obstruction, he saw numerous areas of necrosis without any haemorrhage in the uterine wall whatsoever. He makes the suggestion that in certain cases of ruptured uterus a toxaemic element may play a considerable part in predisposing to the rupture.

The Vessels.

Williams was the first to give a really detailed account of the vessels. In many specimens it is seen that the veins are completely thrombosed, as in Case V. where this was such a prominent feature. The arteries, on the other hand, although they may show changes in their wall, do not usually show any great degree of thrombosis. Many observers, Weiss
(1894), Fraipont (1914), Couvelaire (1912), and Essen-Moeller (1913) and others, have noted that the vessel walls are normal.

One or two points remain for discussion. Some observers, Ley, Davis and McGee and others, have noted a certain amount of leucocytic infiltration of the muscular wall of the uterus, especially around the vessels. In some cases it has been noted that there was a leucocytic infiltration around the areas of haemorrhage, which would seem to indicate that these were of some age. In others, phagocytes containing blood pigment have been observed. Zarate (1915) describes a case where it would appear that the haemorrhages had been of long standing and that repair was occurring. There is no report in the literature on any specimen which has been examined at any length of time after the accident.

It is to be noted that at least two cases have been described where rupture of the uterus has occurred during this accident, - one by Ley and another by Siegel (1934). This occurrence is not surprising. Where the uterus is still actively contractile, it is obvious that rupture might easily occur where there had been any severe haemorrhage locally.

The Other Organs in Accidental Haemorrhage.

The Liver.

In 17 cases collected by Willson where a complete post mortem had been carried out, liver
necrosis and haemorrhages were present in eleven. In the series of eight cases above described there was actual necrosis of the liver cells in three. It will be recalled that liver necrosis is a constant feature of eclampsia and severe non-convulsive pregnancy toxæmia. Williams notes that in two very severe cases there was no evidence of any damage to the liver.

Other changes, such as severe fatty degeneration and infiltration, show that a severe illness has been present, but are of no very great significance.

The Kidneys.

In the series of eight cases described above two had a very definite glomerulo-nephritis and one had a vascular involvement of the kidney. Three others had bilateral cortical necrosis. This condition has been observed quite frequently to be associated with accidental haemorrhage.

Willson's series of 17 post-mortems collected from the literature state that chronic parenchymatous nephritis was present twice, and tubular degeneration in seven cases.

Little help can be obtained from pathological data as to the true incidence of nephritis in accidental haemorrhage, firstly because complete post-mortem examinations are relatively few, and secondly because the histology of glomerular nephritis and its differentiation from other conditions of the kidney
has only recently been definitely established.

The Placenta

A review of the literature on this point reveals the fact that while many observers have remarked on the placenta, others have failed to examine it carefully, although it must be obviously regarded as an important organ in the pathology of accidental haemorrhage. In the series of cases described above there was no record of any detailed examination of the placenta.

Willson merely states that the placenta is recorded as being normal or infarcted in some cases. Most observers who have paid any attention to the placenta seem to have found infarction. Ley has noted this. Amongst the older writers, Seitz found round cell infiltration in those villi which lay in contact with the degenerated decidua. Seitz and von Weiss both have noticed excessive proliferation of the syncytium in their cases.

The very name accidental haemorrhage or ablatic placentae implies placental separation, and this has been observed in all cases. The degree of separation varies within wide limits. Even in severe cases, only a partial separation has been seen. In the majority of these, however, complete separation of the placenta has occurred. It is the usual finding at Caesarian section that the placenta has become entirely detached and is separated from the uterus by
One of Naujok's illustrations showing the typical depression in the middle of the placenta caused by the haematoma.
a varying amount of black blood clot. Frequently the separation occurs in the central part of the placenta and the periphery remains adherent. The term retro-placental haematoma is sometimes applied to this condition. The blood which collects behind the placenta may either remain localised there and form a concealed haemorrhage, or it may gradually separate the membranes and give rise to the revealed or external type. In very rare cases it may burst into the amniotic sac and collect there. The first two types frequently co-exist. Hofbauer (1925) has described an interesting case where there was placental separation at the upper rim of the placenta. Blood separated off the membranes and a large retromembranous haematoma was formed, the bleeding being entirely concealed.

The retroplacental haematoma is usually adherent to the placenta at some part and occasionally forms a depression on it. Young (1914) gives a detailed description of the changes which he believes to occur on the basis of nine placentae. The changes are those of the early infarct. In one case where there was very fresh clot adherent to the placenta, the vessels of the underlying villi were very congested and dilated. In the next stage he believes that fibrin is deposited in the intervillous spaces and then consolidation takes place. His main hypothesis is that the infarctions are consequent upon the
Illustration of a small haemorrhage subtending a placental infarct. (Young).
placental separation. In all Williams' (1926) cases the placenta was thoroughly examined. He particularly examined the placenta histologically at the base of those areas where it had been separated by blood clot. He found in every instance that this was lined with decidua and the only possible conclusion was that the haemorrhage which caused the separation had commenced in the decidua.

It may be concluded therefore, that accidental haemorrhage is frequently associated with infarction of the placenta and that haemorrhage probably commenced in the decidua.

(3) That there is evidence of vascular change. In many cases there is very extensive thrombosis of the vessels of the umbilical cord and round ligament.

(4) Placental infarctions are frequently present. These would all seem to indicate that these vascular changes or changes in the intervillous space are due to the same cause. It is also evident that in any case where decidua infarction, infarction of the intervillous space, and other placental veins, and also intervillous space,
SUMMARY AND CONCLUSIONS.

From a study of the pathology of accidental haemorrhage several very definite features are noted in the uterus in all well marked cases. These are:

1. The presence of numerous haemorrhages in the myometrium. These exist chiefly in the outer half but are constantly present to some extent in the inner half and in the decidua.

2. That associated with this there is necrosis of muscle cells and that some observers have noted these in areas widely separated from any haemorrhage.

3. That there is evidence of vascular damage. In many cases there is very extensive thrombosis of the veins of the uterus and broad ligament.

4. Placental infarctions are frequently present. These would all seem to indicate that some toxic poison or process is operating and that this poison would have some specific effect on the blood vessels. It is also evident that in any given case there may be observed as part of the same process, placental infarction, retroplacental haemorrhage - revealed or concealed, thrombosis of the uterine and other pelvic veins, and also intra-uterine haemorrhages.
Each case of the series which has been described was of the severe type, and in every case there was a record of hypertension and albuminuria. It is probable that in the milder cases, various causes other than toxaemia play a part; mild trauma and a high marginal placenta praevia, beyond reach of the exploring finger, are possible causes. In the severe cases there is an undoubted association with toxaemia, and in some cases with chronic and acute nephritis. In all the larger investigations relatively low percentages of nephritic cases have been recorded. It is probable that the presence of a nephritic lesion would accentuate any toxaemic tendency which might be present and might convert a mild case into a relatively severe one. In the case of pure hypertension - essential hypertension - it is possible that patients with a high systolic pressure are more liable to have some vascular accident during pregnancy than a healthy woman. It is, therefore, possible that a certain number of accidental haemorrhages are due simply to hypertension causing rupture of the decidual sinuses, but in these cases there will be no associated signs or symptoms of toxaemia apart from the raised blood pressure.
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