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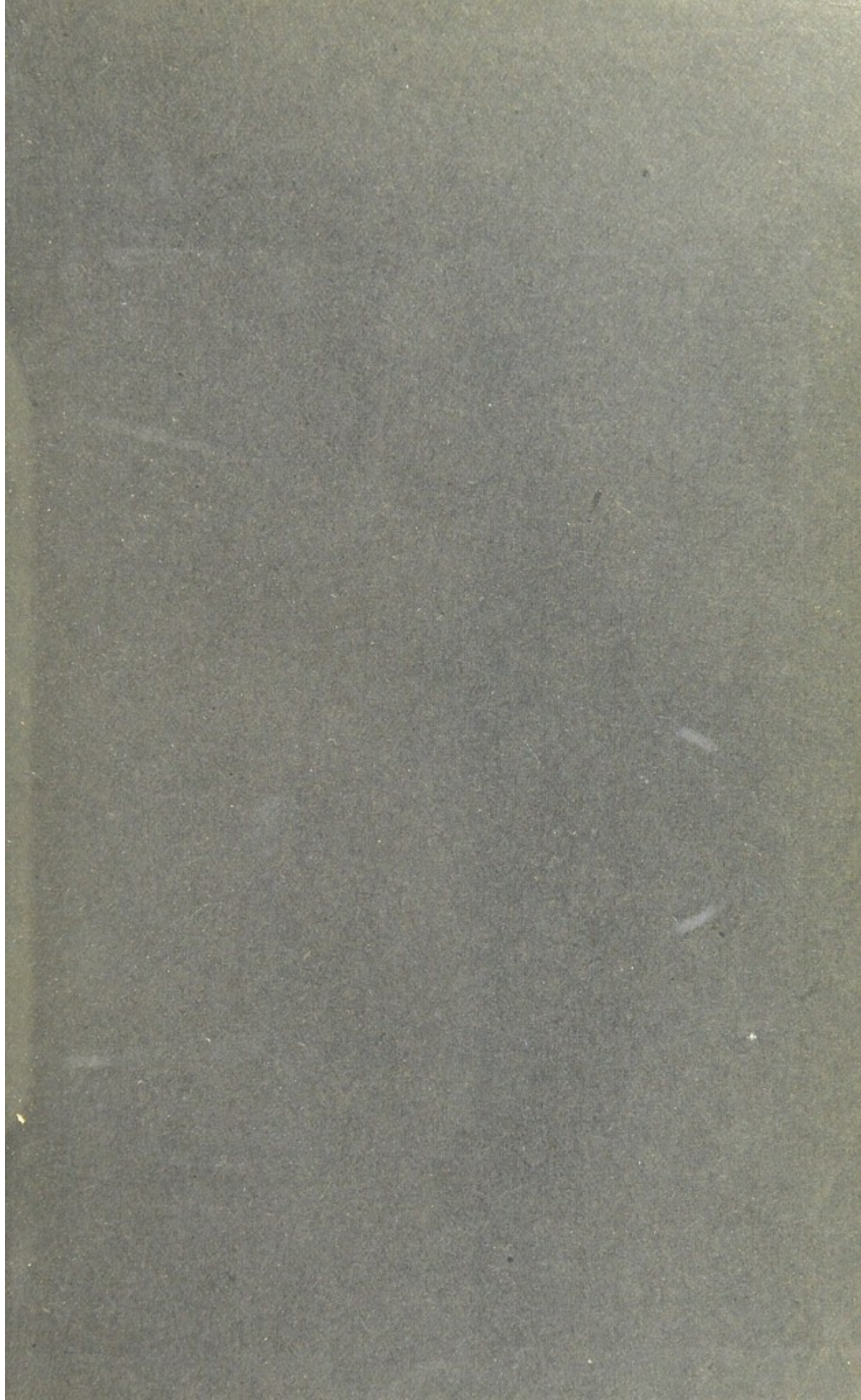
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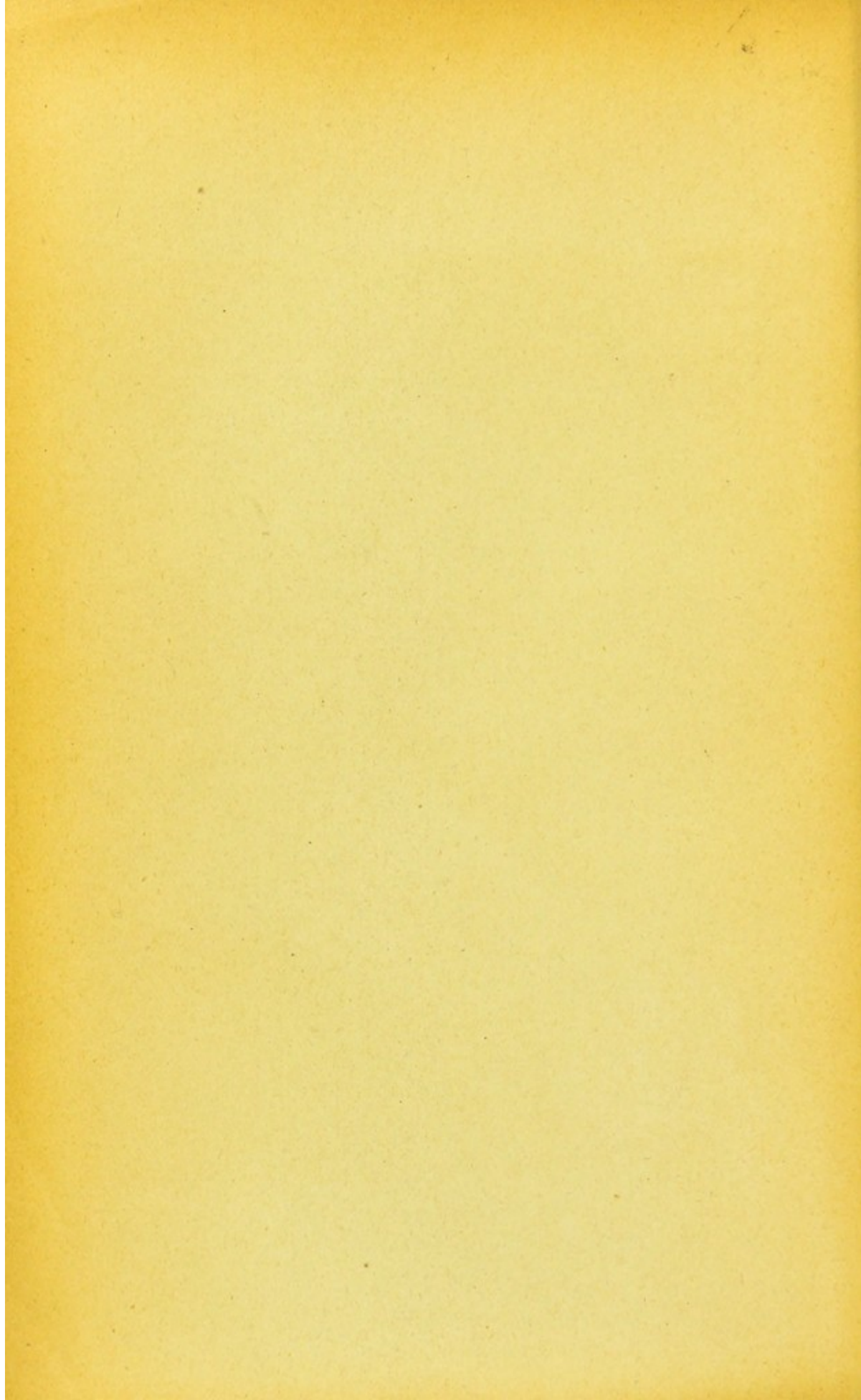
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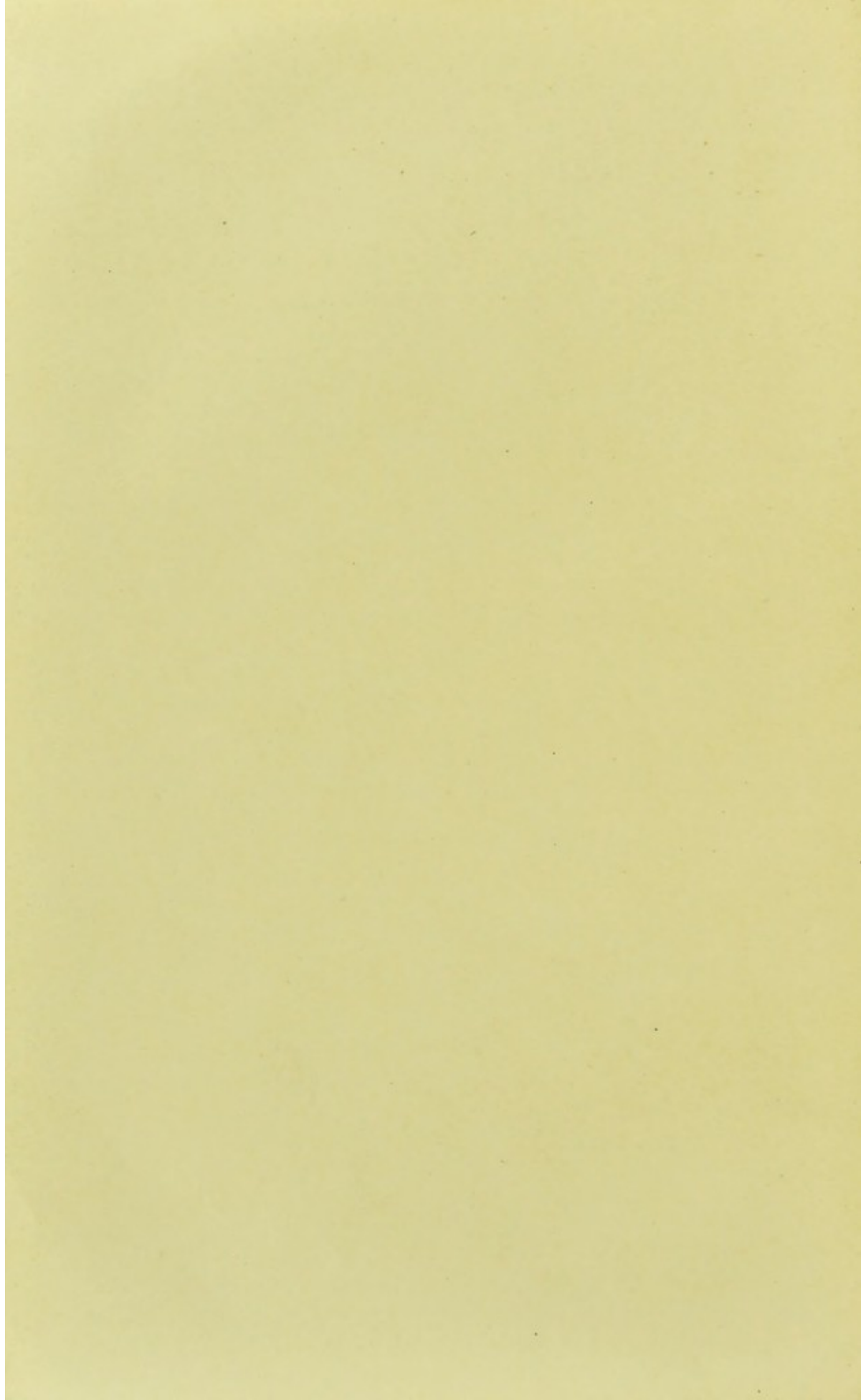


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FORENSIC MEDICINE.
AND
TOXICOLOGY

VOL. II.



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TEXT-BOOK
OF
FORENSIC MEDICINE
AND
TOXICOLOGY

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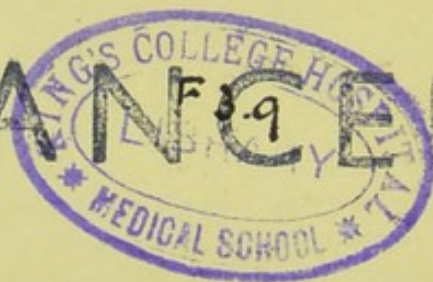
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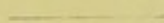
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FORENSIC MEDICINE

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COLOURED STAINS

CHAPTER XXV

Appearance of blood stains—Methods of removing blood stains—Microscopical examination—Spectroscopical examination—Other coloured stains.

To say whether suspected spots are blood is frequently a matter that requires great care and experience in spectroscopic and microscopic examinations. The identification of blood stains not unfrequently furnishes an important link in the chain of evidence in a trial for homicide. It is a common practice when the garments of a suspected murderer are found with red stains on them to attribute the stains to the blood of some domestic animal or bird, or to spots of paint, dye, fruit stains, &c.

Appearance of blood stains.—Blood stains vary very much in size, shape, and colour. If the blood has spurted to a distance from a small artery upon the surface of some non-absorbent object, the spots present a comet-like shape, terminating in a bulbous tail. The upper portion of the spot is

generally of a pale red colour, while to the bulbous extremity the greater portion of the colouring-matter and fibrin has gravitated. Such sprinkling of the blood upon a surface is strongly indicative of its having been ejected from a living body. The colour of a blood stain depends—(i) upon its freshness; if recent, it possesses a bright red colour; if old, the colour is reddish-brown or brownish; (ii) upon its thickness; the thicker a stain the darker its colour; (iii) upon the absorbent nature and colour of the material upon which the blood has fallen; if the material be porous, the colour is dull; if the material be hard and polished, the stains have a shining appearance, provided they are fairly recent. If the stains are on a coloured substance, they are best recognised by artificial light. Before employing any of the tests for blood, a suspected stain should always be examined with a good lens, or with a low power of the microscope. If upon a fabric, the fibres will, in the case of a recent blood stain, present a glossy appearance, and minute clots of blood will be found intermixed with the fibres. If the blood stain be an old one, the fibres will probably appear to be simply stained.

Changes that blood stains undergo by time.—If recent, a blood stain is of a red colour, due to hæmoglobin; after a time, which may vary from a very few hours to several days, it assumes a reddish-brown or brownish colour, due to the conversion of the hæmoglobin into methæmoglobin, and finally into hæmatin. These changes of colour are not entirely determined by the age of the stain, but are considerably influenced by the presence or not of impurities in the air. The presence of acid vapours, such as sulphurous, sulphuric, and hydrochloric acids, in the air materially hasten the colour-changes, by effecting the conversion of the hæmoglobin into the brownish acid-hæmatin. This fact is important to bear in mind, as blood stains are liable to change colour much more rapidly in the atmosphere of a manufacturing or other large town than in country air. Hence the conclusion may be drawn, that if the colour of a blood stain be red, the stain is fairly

recent; but if it be brown, it is no proof that it is an old stain.

Hæmoglobin is a soluble body, whereas hæmatin is very insoluble in water. So that if an article stained with blood has not been washed until sufficient time has elapsed for the conversion of the hæmoglobin into hæmatin, sufficient of the latter will, in all probability, remain to enable it to be detected. If, however, the article has been well washed in cold water whilst the hæmoglobin is unchanged, then no trace of it may be left; but if hot water has been employed, then, owing to its action on the hæmoglobin, sufficient may be left in the fabric for identification. The probability is that the detection of the stain may even be easier if the article has been washed in soap and water, owing to the alkali in the soap rapidly converting the hæmoglobin into hæmatin. It should be borne in mind that rust (oxide of iron) facilitates the change of the blood colouring-matter from the soluble to the insoluble form, so that blood stains produced at the same time on the handle and blade of a knife or other cutting weapon, may present very different appearances.

Methods of removal of blood stains.—If the stain be recent, and if there be sufficient material, a small piece of the stained fabric should be cut out and immersed in a small quantity of cold distilled water in a shallow test-tube, the fabric being pressed from time to time with a glass rod. The colouring-matter is extracted in the course of a few minutes, if the stain be a fairly recent one. If the stain be so old that the colouring-matter is not removed by water, then a weak solution of ammonia may be employed for its extraction. Stevenson recommends a cold saturated solution of borax as a good medium for dissolving the blood pigment from blood stains, and as being well adapted for the examination of stains for blood corpuscles under the microscope. If the stain be upon a porous substance, such as wood, it should be scraped off or cut out, and then treated as described above. If the stain be on the blade of a knife or other steel weapon, it should, if possible, be scraped

off, and then digested in a weak solution of ammonia, the solution being pipetted off or filtered from any rust. As the colouring-matter of blood has a tendency to combine with oxide of iron, it may not be removed from stains on steel weapons by the weak solution of ammonia; it is then advisable to use the cold saturated borax solution with a few drops of solution of ammonia added to it; in this way a solution is obtained that can be submitted to spectroscopic examination. If the knife or other weapon has been wiped, the blood stain may only be represented by a thin film of a yellowish colour; from this sufficient blood colouring-matter may be removed for recognition by the microspectroscope, by repeated washing with a small camel-hair brush dipped in the mixed borax and ammonia solutions. If a clasp-knife is being examined, the joint should be carefully inspected for blood stains, and the knife, if necessary, taken to pieces. Becker¹ advises the employment of solution of ammonia mixed with a little sodium chloride for the extraction of blood colouring-matter from rust. A portion of the suspected rust is digested in the mixed solution in a test-tube for a few hours; the solution is then filtered, and a small portion of it is evaporated to dryness by a gentle heat on a microscope slide; the residue is tested by the 'hæmin test.'

For the microscopic examination of the blood corpuscles in a recent stain, a small piece of the fabric should be cut out and immersed in two or three drops of a mixture of glycerine and water (one part of glycerine to nine parts of water by volume); after a short time the coloured solution may be squeezed out on to a microscope slide, covered with a thin glass, and examined under a high power. It is only if the stain be quite recent that the blood corpuscles will present a fairly normal appearance; as the age of the stain advances, the corpuscles shrivel up and become much distorted in shape, until finally they become completely disintegrated.

¹ *Brit. Med. Jour.*, 1894.

There are three methods for the examination of blood stains, viz. the **microscopical**, the **chemical**, and the **spectroscopical** methods.

MICROSCOPICAL EXAMINATION OF BLOOD STAINS

For this examination the process of extraction with glycerine and water, described on p. 4, should be employed. The human red blood corpuscle is a round, bi-concave disk, without a nucleus. All mammalian red corpuscles have the same form, except those of the camel tribe, which are oval. The corpuscles of birds, fishes, reptiles and amphibians are oval and nucleated. So that if the corpuscles can be obtained from a stain, it is possible to say whether the stain was one of mammalian blood or not, but beyond this the medical jurist cannot go. It is impossible to say whether the blood was that of a human being or of some other mammal. The distinction of mammalian from non-mammalian blood may, however, be a matter of great importance in a criminal trial, where a prisoner may have accounted for certain spots of blood on his clothing by stating that he had been handling game. It should be borne in mind that oval corpuscles may become globular by treatment with an excess of water. The outlines of dried blood corpuscles are irregular and crenated.

Attempts have been made to distinguish between human blood and the blood of other mammals by taking advantage of the fact that the diameter of the human red blood corpuscles is slightly different to the diameters of the corpuscles of the lower animals. To measure the diameters of the corpuscles very high microscopic powers have to be employed, with a micrometer. The average diameter of the human red blood corpuscle is $\frac{1}{3200}$ in. The corpuscles of most of the lower animals are smaller than those of man; the averages for some of the commoner of the lower animals, as given by Formad, being as follows:—*Dog*, $\frac{1}{3580}$ in.; *Rabbit*, $\frac{1}{3662}$ in.; *Ox*, $\frac{1}{4200}$ in.; *Pig*, $\frac{1}{4250}$ in.; *Horse*, $\frac{1}{4310}$ in.; *Sheep*, $\frac{1}{5000}$ in.; *Goat*, $\frac{1}{6100}$ in.

When it is considered that the diameter of the human red blood corpuscle may be considerably affected by the age of the individual and by various diseased conditions, that in a blood stain the process of drying must have caused shrinkage, and that the liquid employed for the extraction of a blood stain may cause a most variable amount of swelling of the corpuscles, it becomes obvious that, in a matter which may involve the life or liberty of an accused person, such measurements of corpuscles cannot be relied upon for medico-legal purposes. The medical witness should limit himself to the statement that the stain is that of the blood of a mammal or not. Copeman¹ has described a method for distinguishing human blood from that of the lower animals by crystallisation of the hæmoglobin in the presence of putrid serum. Under these conditions he finds that, with the exception of the blood of the monkey, the crystals obtained from the blood of the lower animals invariably consist of oxyhæmoglobin, while those which can be obtained from human blood by the use of putrid serum as invariably consist of reduced hæmoglobin. The shape of the reduced hæmoglobin crystals obtained from human blood and monkey's blood is different—those of man being almost invariably rectangular plates, while the crystals obtained from monkey's blood are, for the most part, diamond-shaped plates, of which two adjoining sides are longer than the other two. This method, however, does not seem to be applicable to old and dried blood stains.

There are a few bodies which might be mistaken, under the microscope, for blood corpuscles, and which are occasionally found with them in stains submitted for examination, such as the spores of fungi, starch granules, the disc-bearing cells of pine and other coniferous woods, epithelial scales and oil-drops. All these, however, possess well-marked distinctive characters, which would prevent a practised microscopist confounding them with blood corpuscles.

¹ *Brit. Med. Jour.*, 1889.

CHEMICAL EXAMINATION OF BLOOD STAINS

1. **Effect of heat upon blood.**—If a solution of blood be heated, the following results occur—firstly, the red colour is destroyed; secondly, the solution is coagulated; thirdly, a thick brown precipitate is produced. This peculiar effect of heat serves to distinguish blood from other red colouring matters, such as vegetable dyes, fruit juices, &c.

2. **The guaiacum test.**—This consists in adding to a weak solution of blood a drop or two of tincture of guaiacum, which produces a buff-coloured precipitate of guaiacum resin; on the subsequent addition of either an aqueous solution of peroxide of hydrogen or of an ethereal solution of the same substance (known as *ozonic ether*), a blue or bluish-green colour is developed if blood be present. In case the solution is turbid, from an excess of the resin, the addition of a little alcohol will instantly clear it, and cause the blue colour to appear more distinctly. The working of the test depends upon the liberation of nascent oxygen from the hydrogen peroxide in presence of blood, the nascent oxygen then converting the guaiacum resin into a blue-coloured oxidation product. It is to be borne in mind that the production of a blue colour with tincture of guaiacum alone is not an indication of the presence of blood, for tincture of guaiacum is coloured blue by milk, saliva, pus, and other bodies. It should, therefore, always be ascertained that tincture of guaiacum alone is not coloured, and that the blue colour is developed only on the subsequent addition of peroxide of hydrogen. Even then, the test is only to be regarded as one suggesting the presence of blood, the proof of its presence requiring the employment of the hæmin test and spectroscopic examination, since other substances than blood possess the property of yielding a blue colour with guaiacum and peroxide of hydrogen. This test is, therefore, only to be regarded as an easy preliminary test, but which, both in its positive and negative aspects, requires corroboration by other methods for the detection of blood. The guaiacum test may be roughly applied

to blood stains on a fabric, by moistening the spot with two or three drops of water, then with a drop of tincture of guaiacum, and afterwards with a few drops of ozonic ether; if a piece of white filtering-paper be then pressed upon the moistened stain, the blue colour will appear upon the paper.

3. **The hæmin test.**—Hæmin crystals (*Teichmann's crystals*) consist of the hydrochlorate of hæmatin. They are prepared from a dried blood residue by the action of nascent hydrochloric acid as furnished by a mixture of sodium chloride and glacial acetic acid in presence of blood colouring matter. The

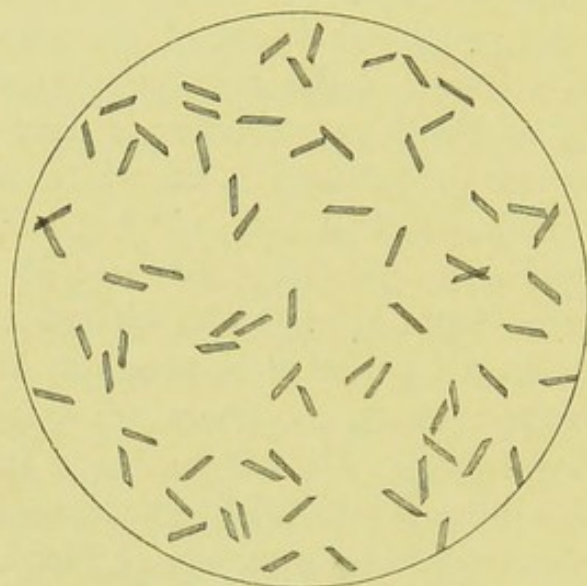


FIG. 25.—HÆMIN CRYSTALS (Magnified 450 diameters)

crystals are easily recognised under the microscope, and furnish the most conclusive of the chemical tests for blood. To obtain the test from a stain on clothing, a small piece of the stained fabric should be cut out, and laid upon a microscope slide. A minute crystal of sodium chloride is then placed in the centre of the piece of fabric, and sufficient glacial acetic acid dropped on it to thoroughly saturate, or rather over-saturate, it.

The acid should be well worked into the piece of fabric by kneading it with the end of a glass rod, and the fabric should then be rolled up on a piece of platinum wire turned at one end so as to grip it; it will now be easy to express a dirty brown fluid from the fabric by pressure with the glass rod, the fluid being manipulated to the middle of the slide, where a thin cover-glass is dropped upon it. The centre of the slide is then passed to and fro over the flame of a bunsen-burner so as to produce active ebullition of the acetic acid under the cover, which should be continued until it has boiled to dryness. The slide

is then allowed to cool and examined under a fifth or sixth inch objective. Under the microscope the crystals appear of a brown colour, with a steel blue lustre by reflected light. They mostly take the form of rhombic plates (fig. 25), which occasionally are superimposed so as to form crosses or stars; they vary very much in size, sometimes being large, whilst at other times they are extremely small. For the application of the hæmin test to blood stains mixed with rust on knives and other weapons, see p. 3.

SPECTROSCOPICAL EXAMINATION OF BLOOD STAINS

The age of a stain is no impediment to the use of the spectroscopic test. Hæmatin, into which the hæmoglobin finally changes, is a very permanent body; it does undergo certain changes by time, but these changes, which are but little understood, are of no practical moment. Sorby states that he was able to discover the hæmatin bands in a stain forty-four years old, and Tidy obtained excellent spectra from stains which he believed were over a hundred years old. The solution for spectroscopical examination is prepared from the stain by one of the methods described on p. 3. If an alkali be used in the extraction of the stain, the solution obtained will be one of hæmatin, since if the blood colouring-matter has not already undergone that change, alkalies convert hæmoglobin into hæmatin. If the alkaline solution of hæmatin be reduced, the typical spectrum of reduced hæmatin or hæmochromogen, as it is also called, will be obtained. This test is applicable even in cases where no hæmin crystals are obtainable. Struve's process for the extraction of blood stains is to place the portion of stained fabric in a test-tube, cover it with cold water, and allow a stream of carbon dioxide to slowly pass through the liquid. In a period varying from a few minutes to an hour's exposure to the gas, a solution is obtained for spectroscopical examination.

If there be sufficient solution, it may be examined in a test-

tube or glass cell with parallel sides, with either a direct-vision spectroscope or with a single prism one. If the quantity of fluid be very small, then the microspectroscope must be used, the fluid being placed in a Sorby's cell, which should be filled with the fluid under examination, and a thin cover-glass placed on the upper end, the inclusion of air-bubbles being avoided. The cell is then placed on the stage of the microscope, to which the microspectroscope has been previously fitted. The mirror of the microscope is adjusted so as to reflect the rays of light up through the fluid in the Sorby's cell. The microspectroscope is so arranged as to allow of two similarly illuminated spectra to be seen side by side, so that the spectrum of the solution under examination can be compared with the spectrum of a solution of blood colouring-matter in a known condition. A bright artificial light is preferable to daylight, and if it be required to ascertain the position of the D line of the solar spectrum, this can be done by introducing a platinum wire, moistened with a solution of a sodium salt, into the flame.

The various blood spectra are shown on the Frontispiece, which should be referred to in connection with the following descriptions:—If the solution of the colouring-matter were obtained from a very fresh blood stain, the **spectrum of hæmoglobin**, or **oxyhæmoglobin** as it is also called, will be seen; this consists of two absorption bands, in the yellow and green portions of the spectrum, situated between the D and E lines of the solar spectrum, the band nearest the D line being narrower and possessing more sharply defined edges than the other. If the solution has been obtained from an older stain, then, according to the age of the stain, the methæmoglobin band in the red portion of the spectrum becomes more and more evident, while the bands between the D and E lines proportionately fade. If the solution of the colouring-matter has been made with an alkali (ammonia), then a solution of alkaline hæmatin is produced, the spectrum of which is very difficult to obtain, but which, when converted into reduced hæmatin, yields one of the most characteristic of the blood spectra.

The presence of blood in a stain may be conclusively proved by means of the spectroscope. But as other colouring-matters yield spectra closely resembling the spectrum of oxyhæmoglobin, the fluid under examination must be made to yield successively the spectra of reduced hæmoglobin and of reduced hæmatin to render the presence of blood, as shown by the spectroscopic test, certain. No colouring-matter other than blood will give, in addition to the spectrum of oxyhæmoglobin, the bands of reduced hæmoglobin and of reduced hæmatin.

The spectrum of methæmoglobin.—The exact constitution of methæmoglobin is somewhat doubtful, but, according to Hüfner and Külz, it contains the same amount of oxygen as oxyhæmoglobin, only in a closer state of combination. As previously stated, the colouring-matter of a blood stain may have passed from the condition of oxyhæmoglobin into that of methæmoglobin before the stain is examined. The spectrum of methæmoglobin shows three absorption bands, one in the red about half way between the c and d lines, and two others between the d and e lines, which are practically in the same position as the bands of the oxyhæmoglobin spectrum. The methæmoglobin spectrum may therefore be said to resemble the oxyhæmoglobin spectrum, with the addition of an absorption band in the red, which is narrower and darker than the two other bands.

The spectrum of reduced hæmoglobin.—Reduced hæmoglobin may be obtained from a solution of either oxyhæmoglobin or of methæmoglobin, by the addition of a small quantity of a reducing agent, such as ammonium sulphide, or Stokes's reagent (an aqueous solution of ferrous sulphate, to which tartaric acid and then excess of ammonia have been added). The spectrum of reduced hæmoglobin consists of a broad band, with ill-defined edges, covering most of the spectrum between the d and e lines, and slightly overlapping the d line.

The spectrum of reduced hæmatin (hæmochromogen).—The absorption bands of this spectrum give by far the most

sensitive spectroscopic reaction. Hæmoglobin is decomposed into hæmatin and globin by acids, by alkalies, and by age. Accordingly as an acid or alkali is employed, *acid hæmatin* or *alkaline hæmatin* will result; the spectra of both these substances are difficult of recognition, and for the identification of blood colouring-matter it is not necessary that they should be examined. Either of them, however, can be converted by means of a reducing agent into **reduced hæmatin** or **hæmochromogen**, the spectrum of which is well defined and easily recognised. Reduced hæmatin is prepared by adding to the solution of oxyhæmoglobin or of methæmoglobin a few drops of a strong solution of caustic potash or soda, by which means alkaline hæmatin is formed; the subsequent addition of a few drops of ammonium sulphide to the solution converts the alkaline hæmatin into reduced hæmatin, the reaction being accompanied by a change of colour, the solution becoming somewhat claret-coloured. Linossier¹ recommends the addition of a drop of a freshly prepared solution of sodium hyposulphite to the blood solution, and then the further addition of one or two drops of a concentrated solution of caustic soda to bring about the conversion of the hæmoglobin into reduced hæmatin. The spectrum of reduced hæmatin is the most pronounced of all the blood spectra. It consists of two bands, more towards the violet end of the spectrum than the bands of oxyhæmoglobin. The band nearer to the red end of the spectrum is dark, and possesses well-defined edges; it is situated at about an equal distance from the D and E lines, and mainly occupies the luminous region which separates the two bands of oxyhæmoglobin. The second band is more diffused and not quite so well defined; it occupies the portion of the spectrum between the E and b lines, and slightly overlaps both of those lines. To gently warm the solution favours the appearance of this spectrum, but if the solution be very dilute, the bands may only appear after the liquid has completely cooled. With extremely dilute solutions of blood, the more intense band is the only one

¹ *Bull. Soc. Chim.*, 49, 691-694.

that can be distinctly observed; under such conditions, to make sure that the spectrum is really that of reduced hæmatin, the band should disappear if the liquid be heated to 50° C. without agitating, and reappear on cooling. If the blood colouring-matter has been radically changed by putrefaction, the spectroscopic reaction of reduced hæmatin may be the only test by which the presence of blood can be proved.

As there is a possibility of the spectra of methæmoglobin and acid hæmatin being mistaken for one another, they may be readily distinguished by the addition of an alkaline reducing agent, when the methæmoglobin spectrum changes to that of reduced hæmoglobin, and the acid hæmatin spectrum to that of reduced hæmatin.

Where the amount of blood stain is small, the spectroscopic tests should always be resorted to before the chemical tests are employed. The spectroscopic tests above described constitute the most delicate and certain means of detecting minute quantities of blood.

Other colouring matters than blood.—According to Sorby, although certain other bodies produce absorption bands somewhat resembling those of oxyhæmoglobin, nothing gives a spectrum precisely similar, at all events, to the eyes of a practised observer. Thus, the colouring-matter of the petals of *Cineraria* gives two absorption bands; cochineal, madder, and other red dyes, dissolved in alum solution, also give bands somewhat resembling those produced by blood. All these colouring-matters may be distinguished from the latter in that their colours are not affected by heat, but are changed on the addition of a weak solution of ammonia. Stains from cochineal, kino, madder, logwood, red flowers, and fruits, and red-wine stains do not stiffen linen and cloth in the way that blood does. Moreover, they do not respond to the guaiacum test. The coloured juices of red fruits and red flowers turn a blue or greenish colour on the addition of a weak solution of ammonia; a solution of blood is not appreciably altered in colour by that reagent. The coloured juices are neither

coagulated, nor is their red colour destroyed by boiling; a solution of blood is coagulated by boiling, and its red colour is at the same time destroyed.

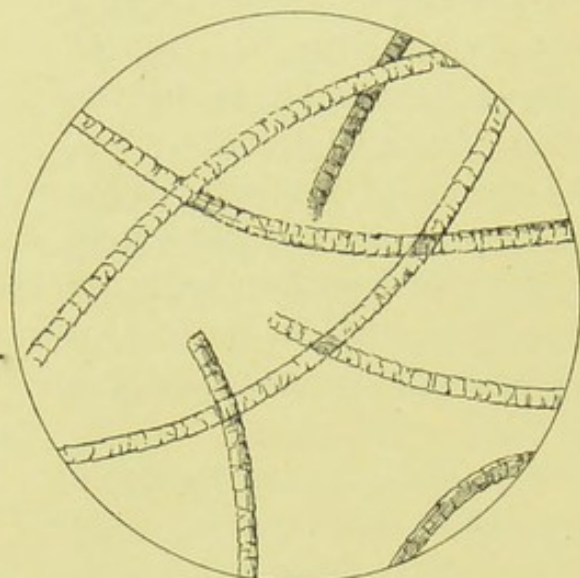


FIG. 26.—WOOLLEN FIBRES
(Magnified 340 diameters)

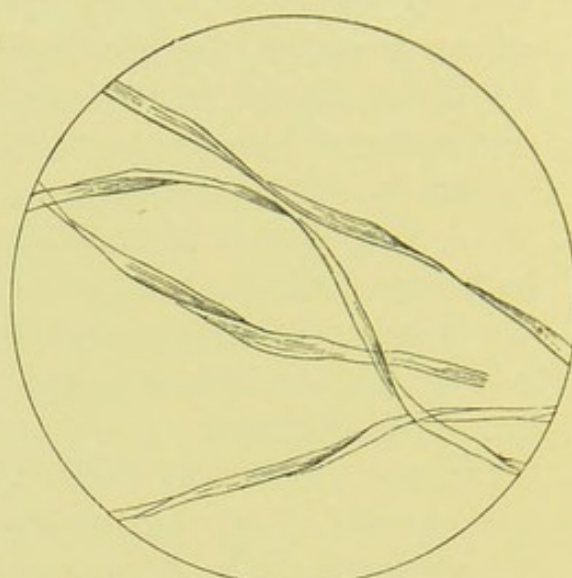


FIG. 28.—COTTON FIBRES
(Magnified 340 diameters)

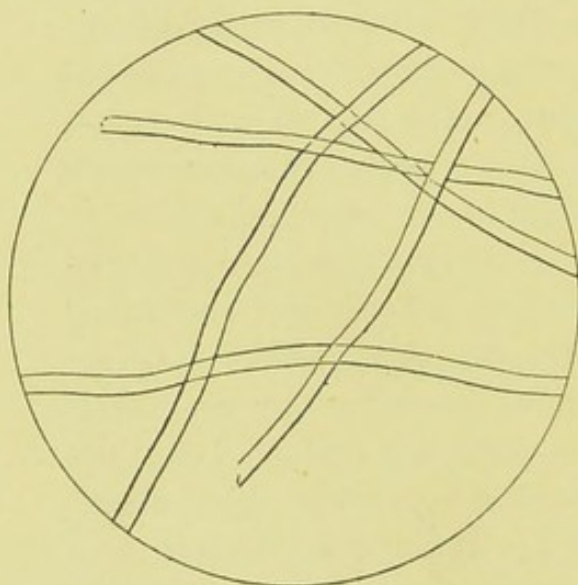


FIG. 27.—SILK FIBRES
(Magnified 340 diameters)

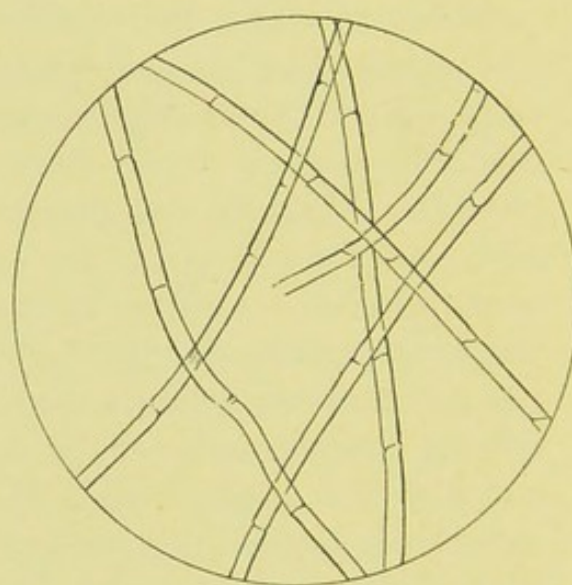


FIG. 29.—LINEN FIBRES
(Magnified 340 diameters)

It should be borne in mind that the stains of certain organic salts of iron, notably the citrate and the malate, may on the blade of a knife present a very strong resemblance to blood

stains. If the blade of a steel knife has been used in cutting fruit, such as oranges, lemons, or apples, and is then left unwiped and exposed to the air, a stain of the citrate or malate of iron forms on the blade. Such stains have been pronounced on superficial examination, even by medical men, to be blood stains. The solutions obtained from these stains yield none of the reactions of blood. *Iron-mould stains* on linen are of a reddish-brown colour; they are insoluble in water and in solution of ammonia; they are readily dissolved by hydrochloric acid, the solution yielding the reactions for iron, but none of the reactions of blood. *Red-paint stains* have occasionally been mistaken for blood stains; they are insoluble in water, but are generally soluble in hydrochloric acid, the solution yielding none of the reactions of blood.

The composition of a fabric upon which a stain is found should be determined by teasing a small quantity of it in glycerine and water, and examining it under the microscope (figs. 26, 27, 28, and 29).

WOUNDS AND MECHANICAL INJURIES

CHAPTER XXVI

Definition of a wound—Examination of wounds on the dead body—Distinction of wounds inflicted during life and after death—Bruises—Wounds produced by weapons—Incised wounds—Punctured wounds—Lacerated wounds—Contused wounds—Stabs.

THE surgical and legal definitions of a wound are not identical. In works on surgery a wound is generally defined as 'a recent solution of continuity in the soft parts, suddenly occasioned by external causes,' or, in the words of Wiseman, as 'a solution of continuity in any part of the body, suddenly made by anything that cuts or tears, with a division of the skin.' Both of these definitions involve a rupture of the skin or mucous membrane to constitute a wound. Such definitions would not regard as wounds ruptures of the liver or spleen, simple dislocations, simple fractures and burns, although these, from the medico-legal point of view, should be included in the definition of a wound. The definition is extended beyond that given by the surgeon by the words which follow in the statute—'Whosoever shall, by any means whatsoever, wound or cause any grievous bodily harm to a person.' As a matter of fact, the last clause of this sentence fortunately obviates the necessity for defining whether a given injury is or is not a wound. In the past, owing to vague definitions being employed by some medical witnesses, acquittals have frequently taken place upon mere technicalities, or the grave offence of 'wounding' has been converted into the minor offence of 'common assault.'

From the legal point of view a breach of continuity of the tissues may be regarded as a wound, although neither the superjacent skin nor mucous membrane is involved in the injury. Simple dislocations, simple fractures, ruptures of viscera, such as the liver, spleen, bladder, &c., if suddenly caused by external violence, are in the legal sense wounds, although the skin may be in no way implicated in the damage. Perhaps the best medico-legal definition of a wound that can be given is as follows:—*A wound is a breach of continuity in any of the structures of the body, whether external or internal, with or without a solution of continuity of the skin, suddenly caused by external violence.*

Wounds dangerous to life.—In reference to persons charged with wounding or attempting to murder, a medical man may be required by a magistrate to give a written or verbal opinion as to whether the wound is dangerous to life or not, in order that the magistrate may decide whether he is justified in detaining the prisoner in custody or in admitting him to bail. The interpretation of the words ‘dangerous to life’ is left to the medical witness, who, consequently, must be prepared to give clear and satisfactory reasons for the opinion he has expressed, the opinion being frequently submitted to a rigorous cross-examination by the counsel for the prisoner. The medical witness must only consider a wound dangerous to life, *in the legal sense*, when that danger is *imminent*, such as in connection with wounds of any of the viscera, of a large blood-vessel, or in the case of a compound and depressed fracture of the skull. If the danger to life be only a remote one, and dependent on certain contingencies under certain circumstances, then the opinion given should be a qualified one. For instance, any wound, but especially a lacerated wound of the scalp, may be followed by erysipelas; a punctured or lacerated wound may be followed by tetanus. These complications, which may prove fatal, are not, however, necessary sequelæ of the injuries. The medical witness, in expressing an opinion as to the nature of the wound, should mention the possible occurrence of these

dangerous complications, but he should not describe such wounds as dangerous to life, when the danger is dependent on the occurrence of a complication which may not supervene.

Wounds causing grievous bodily harm.—A wound may produce 'grievous bodily harm,' although it may not be dangerous to life. This especially applies to cases in which the wounds are, or may be, attended with considerable personal inconvenience, or may injuriously affect the health of the wounded party. The punishment meted out by the law depends, not so much on the amount of grievous bodily harm inflicted or produced, as on the *intent* of the assailant at the time of inflicting the injury. Thus the wound may not be of a serious nature, and yet the intention of the assailant may have been to do grievous bodily harm; or, on the other hand, the injury may be a serious one, and yet the prisoner may not have intended to do grievous bodily harm. In *Reg. v. Davis* (Chelmsford Ass., 1871) a man was charged with wounding with *intent* to do grievous bodily harm. The prisoner, when half drunk, suddenly stabbed the prosecutor, inflicting a dangerous wound, with which he was laid up for a month. It was contended that there was no intent to produce grievous bodily harm. Bramwell B. said the jury might satisfy themselves on that point by looking to the circumstances of the case. Could a man inflict such a wound without having an intention to inflict grievous bodily harm? The circumstances showed premeditation and intention. The prisoner was found guilty of the intent. A judge, in summing up in a case, in which a man was indicted for feloniously wounding a girl, with intent to do grievous bodily harm by kicking her, told the jury that the material question for them to consider was the *intent* of the prisoner. It was not because serious injury was the result of a prisoner's act that they were therefore to infer his intention was to do that injury. They were to judge, from all the circumstances, whether, at the time he kicked the prosecutrix, he intended to do her grievous bodily harm, as was imputed to him by the

indictment, or whether he was merely guilty of a common assault. He was found guilty of the latter.

RULES FOR THE EXAMINATION OF WOUNDS ON A DEAD BODY

A medical man, when called to see a wounded dead body, should, previous to disturbing the body, note the external appearance of the wound, and the presence or absence of blood around it. If blood be present, the amount should be noted, and also whether it be coagulated or not. Previous to the minute examination of the wound, the presence or absence of rigor mortis and of post-mortem stains should be noted; if rigor mortis be present, a note should be made of the parts affected. A sketch should be made showing the situation and general relations of the wound or wounds, and such sketch should be preserved for future production, if required, in a court of law. A detailed examination of the wound or wounds should then be made, attention being specially paid to the following points:—

I. The exact *situation* of the wound.

II. The *extent* of the wound, which should include the *length*, the *breadth*, the *depth* as measured by the careful introduction of a soft bougie, and the *direction* taken by the wound.

III. The presence or absence of *effused blood* about the wound; if blood be present, whether it be liquid or coagulated.

IV. The presence or absence of *ecchymosis* or bruising around the wound.

V. The presence or absence of *swelling* of the surrounding parts.

VI. The effusion of *lymph* or *pus* about or into the wound.

VII. Whether the edges of the wound are *gangrenous* or not.

VIII. Whether *foreign substances* are present in the wound or not.

A soft bougie should then be introduced to the termination

of the wound, great care being taken not to extend the wound, and a dissection should be carried on around the bougie, as far as it has penetrated. A note should be made of all the structures that have been divided by the injury. It is important to bear in mind that, however obvious it may be that the wound was the actual cause of death, the post-mortem examination is not to be limited to that part. All the cavities of the body must be opened, and all the organs carefully examined. If this procedure be omitted, it may be contended, by counsel defending a prisoner, that a natural cause of death may have been present in any organ or cavity not examined. In the inspection of a wounded body, the state of the stomach must not be overlooked. Death may apparently have been caused by violence, and yet in reality be due to poison. Wildberg reports the case¹ of a girl who had died, apparently, from the effects of violence, inflicted while her father was chastising her for stealing. On the arms, shoulders, and back many marks of blows were found; and under some of them blood was effused in large quantity. The injuries, although severe, did not, however, appear sufficient to account for sudden death. He therefore proceeded to examine the cavities, and on opening the stomach he found it very much inflamed, and lined with a white powder, which was proved to be arsenic. It turned out that, on the theft being detected, the girl had taken arsenic for fear of the father's anger. She vomited during the flogging, and died in slight convulsions. Upon this Wildberg imputed death to the arsenic, and the man was discharged.

Taylor and Stevenson also mention the case of a gentleman who took eleven grains of strychnine, and then threw himself out of a window, sustaining great bodily injury. The surgeon, finding so much more spasm than could be accounted for by the violence sustained, discovered the real state of the case from the patient's confession.

¹ Taylor and Stevenson's *Med. Jurispr.*, vol. i.

METHODS OF DISTINGUISHING WOUNDS INFLICTED DURING LIFE FROM THOSE INFLICTED AFTER DEATH

CHARACTERS OF INCISED WOUNDS INFLICTED DURING LIFE AND AFTER DEATH

During life	After death
<ol style="list-style-type: none"> 1. Retraction and eversion of the edges, from the vital elasticity of the skin, areolar tissue and muscles 2. Abundant bleeding, as a rule, which is frequently arterial 3. Surrounding parts infiltrated with blood 4. Presence of coagula in the wound and around it <p>The following additional signs are present if the person has lived for some time after the infliction of the wound</p> <ol style="list-style-type: none"> 5. Effusion of lymph or pus 6. Edges of the wound swollen 7. Marks of gangrene about the edges 8. Commencing cicatrisation 	<ol style="list-style-type: none"> 1. The wound resembles a slit; the edges are close and not everted, unless the wound has been made within a very short time of death (see p. 29) 2. Absence of copious bleeding; if any, it is venous 3. Surrounding parts not infiltrated with blood, or but very slightly 4. Absence of coagula <ol style="list-style-type: none"> 5. No effusion 6. No swelling of edges 7. No marks of gangrene 8. No cicatrisation

CHARACTERS OF LACERATED WOUNDS INFLICTED DURING LIFE AND AFTER DEATH

During life	After death
<ol style="list-style-type: none"> 1. More or less bleeding 2. Presence of coagula in the wound and around it 3. Evidence of vital reaction, such as inflammation, repair, or necrotic changes, if the person has survived for some time after the infliction of the wound 	<ol style="list-style-type: none"> 1. Scarcely any bleeding, unless a large vein has been torn across 2. Absence of coagula 3. No evidence of vital reaction

CHARACTERS OF CONTUSED WOUNDS INFLICTED DURING LIFE AND AFTER DEATH

During life	After death
1. Swelling from effusion of blood	1. Very little swelling, unless the wound was inflicted very soon after death
2. Effusion of blood into areolar tissue	2. Little effusion of blood
3. Presence of coagula in the wound and around it	3. Absence of coagula
4. Colour-changes around the wound	4. No colour-changes, unless the wound was inflicted very soon after death
5. Colours gradually fading away, if the person has survived for some time after the infliction of the wound	5. No fading of colour, if present
6. Gangrene and sloughing may have occurred, if the person has survived for some time after the infliction of the wound	6. No gangrene and sloughing

CHARACTERS OF PUNCTURED WOUNDS INFLICTED DURING LIFE AND AFTER DEATH

During life	After death
1. More or less hæmorrhage	1. Little or no hæmorrhage
2. Presence of coagula in the wound and around it	2. Absence of coagula
3. Evidence of vital reaction, such as inflammation, repair, or necrotic changes, if the person has survived for some time after the infliction of the wound	3. No evidence of vital reaction

If a wound has been inflicted soon after death, and while the body is still warm, the distinction is not then so well marked. In the case of *Greenacre*, who was convicted in 1837 of the murder and mutilation of a female, the question was raised whether the severance of the head from the body had taken place during life or after death. The chief medical witness,

Girdwood, expressed himself with proper caution, by stating that the wounds in the neck had been inflicted either during life or very shortly after death, while the body still preserved its warmth. The circumstantial evidence tended to show that the deceased was first stunned, and that her head was cut off while she was in a state of stupor. Commenting on this case, Taylor and Stevenson¹ remark that 'it is a considerable step in evidence, when we are able to assert that a particular wound, found on a dead body, must have been inflicted either during life or immediately after death; for it can scarcely be supposed that in a case calling for criminal investigation, anyone but a murderer would think of inflicting upon a body, immediately after death, a wound which would assuredly have produced fatal effects had the same person received it while living.'

Amount of blood from or about a wound.—In the tables for the distinction of wounds inflicted during life and after death, it will be seen that copious effusion of blood is one of the well-marked signs of a severe wound received during life. This applies especially to *cuts* and *stabs*. Severe wounds of the *lacerated* and *contused* kinds may be inflicted without much loss of blood, even though a large blood-vessel may be involved in the injury. For instance, in machinery and railway accidents an entire limb may be torn away from the body, and yet very little bleeding may occur. This is due to arrest of hæmorrhage by twisting and contraction of the severed arteries, aided by their retraction within their sheaths. In such cases, however, coagula are found adhering to the separated parts, indicating that the wound was inflicted either during life or shortly after death.

BRUISES OR ECCHYMOSES FROM VIOLENCE

An ecchymosis or bruise consists of an effusion of blood, from small ruptured vessels, into the areolar tissue beneath the skin, producing the well-known 'black and blue' discolouration. If the effusion of blood be rapid, the spot is of a dark red colour

¹ *Med. Jurispr.*, vol. i.

at first ; if slower, the discolouration is deep blue. In some cases of even violent contusion, there may be no appearance of external bruising. The ecchymosis need not always be produced over the seat of the contusion, but may form at a little distance from it, especially if the surrounding tissue be loose. For instance, a blow over the eye frequently produces an ecchymosis of the lower lid ; a blow over the lower portion of the abdomen may be followed by ecchymosis of the scrotum.

It should be remembered that the infliction of a very slight degree of violence may be sufficient, in some people, to produce bruises. This is especially the case with women of flabby constitution and possessing soft skins ; with them a comparatively gentle grasp of the arm may be sufficient to produce a bruise showing the several points of pressure produced by the thumb and fingers, and it would be quite possible to attribute the production of such a bruise to the use of excessive violence. Superficial ecchymoses make their appearance within a few minutes of their causation. Deep-seated ecchymoses may not appear for days. If a quantity of blood be effused at some distance from the surface, there may be no discolouration of the skin, but only a sense of fluctuation on palpation.

It should be remembered that ecchymosis may be produced by the rupture of vessels caused by violent muscular contractions, and quite independently of the direct application of violence to the surface. This is due to the muscular contractions either stretching or compressing the vessels to such an extent as to cause their rupture, with consequent effusion of blood. Ecchymoses have been so produced by the muscular contractions connected with the act of vomiting, and with epileptic convulsions, also by the sudden muscular contractions caused by a person endeavouring to save himself from falling. Cabadé¹ has reported the case of a carpenter, aged forty, robust, and free from cardiac and vascular lesions, who, after an attack of epilepsy, which occurred in bed, presented on the morrow subcutaneous extravasations of blood involving the chest from the subclavi-

¹ *The Lancet*, 1892.

cular region to the base of the thorax on the right side, and to the crest of the ilium on the left side. The arms and the shoulders were also enormously swollen and discoloured from the same cause, the circumference of the former being twenty-one inches. At the seats of the ecchymoses the skin was hard, raised, and tense, and great pain was complained of in the arms and shoulders, this being probably due to compression of the brachial plexus by the effused blood. The ecchymoses underwent the usual changes of colour, and it was fully two months before they finally disappeared. Ecchymoses produced by rupture of vessels from powerful muscular contractions may be distinguished from those resulting from the application of mechanical violence by the absence of superficial marks of injury, and by the surface of the skin being smooth and free from abrasions.

Changes of colour in bruises.—These are of service in enabling an opinion to be formed as to the time that has elapsed since a bruise was inflicted. Usually in from eighteen to twenty-four hours the dark-blue edge of the bruise becomes lighter, and acquires a violet tint; later it passes successively through shades of green, yellow and lemon-colour, and then finally disappears. During these changes of colour the bruise is much increased in size, but the central portion always remains darker than the periphery. The changes are due to alteration in and absorption of the blood pigment. When the blood pigment is entirely absorbed the colour disappears. In the majority of cases the violet colour remains for about three or four days; the green colour appears from the fifth to the sixth day; the yellow from the eighth to the tenth day; and in healthy individuals the complete disappearance of the bruise occurs from the twelfth to the fourteenth day. The changes are more rapid in the young than in the old, and also depend on the amount of blood effused. The above-mentioned changes of colour never appear in contusions on the dead. Pepper¹ directs attention to a change in colour occasionally undergone

¹ *The Lancet*, 1887.

after death by superficial subcutaneous extravasations, which at first are bluish-black and subsequently become pink or scarlet. Occasionally it happens that the form of the ecchymosis is of use as giving an indication of the means by which the violence was inflicted. In cases of strangulation where the fingers of the assailant have violently clutched the front of the neck the indentations or bruises produced may help in indicating the manner in which life was destroyed. In hanging, the mark caused by the rope on the neck is sometimes ecchymosed.

Bruises inflicted after death.—Ecchymosis or bruising may be produced as the result of violence applied to a recently dead body, while the blood is fluid and warm. Moreover there is no practical difference between a bruise produced immediately before death and one produced immediately after. Violence inflicted on a living body may not produce ecchymosis until *after death*. Christison found that blows inflicted on a dead body, not more than two hours after death, produced appearances on the skin similar to those which resulted from blows inflicted on a person recently before death. The appearance of a bruise inflicted during life cannot, however, be produced in a dead body after a more prolonged interval than two or three hours after death.

Ecchymosis from natural causes in the living.—Ecchymosis may occur either spontaneously or from the application of very slight pressure in the case of persons suffering from *scurvy*. Another disease liable to lead to the production of spontaneous ecchymoses is *purpura*. Persons subject to *hæmophilia* or the hæmorrhagic diathesis, and who are known as ‘bleeders,’ are also liable to the production of extravasations of blood, either spontaneous in their origin, or following very slight pressure or injury. In aged persons ecchymoses are frequently found on the legs and feet; they are often due to *asthenic hyperæmia*, from torpor of the capillary circulation. Similar ecchymoses are occasionally met with on the fronts of the legs of children and women, produced by warming the legs in front of the fire.

Ecchymosis or bruising not a necessary result of violence.—

The question as to whether ecchymosis is a necessary result of violence is very important from the medico-legal point of view. It has been asserted by medical witnesses that the absence of bruises on a dead body is a proof that no severe blow or blows could have been inflicted on the body of that person. This assertion is incorrect. Ecchymosis is not a necessary result of violence. Ruptures of the stomach, intestines, liver, spleen, and bladder have occurred from the direct application of violence to the abdomen, without any ecchymosis or abrasion of the skin appearing in the region struck. Taylor and Stevenson¹ quote a case of rupture of the liver, under circumstances in which ecchymosis would have been generally expected to take place as a result of violence. A woman, aged seventy-five, was run down by a cab, and died in less than half an hour. No ecchymosis existed, although four ribs on the right side of the chest, at the lower part, were broken, and the liver was ruptured longitudinally in two places, and throughout the entire length of its anterior and convex surface. The laceration of this organ had not been caused by the fractured ends of the ribs penetrating downwards, for of these there was no displacement, but the organ seemed to have burst in consequence of the heavy compression to which it had been subjected, which had not, however, been sufficient to occasion any discolouration of the skin externally. Another case, showing that ecchymosis is not a necessary result of violence, is quoted by Casper.² A waggoner, in guiding his team with a loaded waggon down a hill, was accidentally crushed against a tree on the road. He was found dead the next morning. The only external injuries were a slight abrasion upon the left arm, and one upon the right temple. On opening the body, however, the most striking evidences of violence were discovered. From the spinal canal about a quart of blood escaped. The spinous processes of the first few thoracic vertebræ were broken off. The left pleural cavity

¹ *Med. Jurispr.*, vol. i.

² *Gericht. Med.*, I. 122.

contained about thirty ounces of fluid blood. The pericardium was torn completely across; and the heart, severed from its large vessels, lay almost entirely loose in the cavity of the thorax. The open ends of the aorta and the pulmonary artery were distinctly visible. The left lung was entirely torn through its middle portion; and in the right lobe of the liver was a laceration two inches long and half an inch deep. It can be gathered from these cases that the absence of bruises upon a dead body does not negative the presumption that violence may have been inflicted.

WEAPONS

With regard to wounds produced by weapons, if a weapon be produced in a court of law, and it be such a one as might have produced the wound in question, the medical witness is, as a rule, only justified in swearing that the wound might have been produced by that weapon, or by one similar to it. It is very seldom that he is in a position to swear that a wound must have been inflicted by the particular weapon produced in court. As illustrating the mistake that a medical man may make from carelessness in connection with this point, Schwörer relates the following case. A man was stabbed by another in the face, and a knife, *with the blade entire*, was brought forward as circumstantial evidence against him, the surgeon having stated that the wound had been caused by *this* knife. The wounded person recovered; but a year afterwards an abscess formed in his face, and the broken point of the real weapon was discharged from it. The wound could not, therefore, have been produced by the knife which was brought forward as evidence against the prisoner at the trial.

CHARACTERS OF WOUNDS PRODUCED BY WEAPONS

If, in connection with a case of wounding, no weapon be discovered, the opinion of a medical man as to whether the wound was produced by a weapon, and, if so, by what kind of

weapon, has to be based upon a careful examination of the wound. It is very important that great care should be exercised in forming and expressing such an opinion, as the employment of a weapon implies premeditation on the part of the assailant, and a greater desire to injure than the mere use of manual force. The law therefore attaches great importance to the fact of a wound having been caused by the use of a weapon.

Wounds may be classified in the five following groups :—

- I. Incised wounds.
- II. Punctured wounds.
- III. Lacerated wounds.
- IV. Contused wounds.
- V. Stabs.

I. Incised wounds.—In wounds of this character the tissues are severed by a sharp-edged instrument being drawn through them. An incised wound made with a sharp-edged metal weapon is characterised by the regularity and evenness of the cut, and the sharpness of the weapon can be inferred from the clean and regular appearance of the edge. An incised wound made by glass or earthenware is generally characterised by the irregularity and the unevenness of the edges, which frequently have a more or less contused appearance ; but in some instances the cuts produced by broken glass or earthenware exactly resemble incised wounds made with a knife or other cutting instrument.

As previously mentioned, the edges of an incised wound, if it has been inflicted *immediately* after death, will retract, and so produce gaping of the wound. The extent of the retraction is less than during life ; but, since it occurs, it should be borne in mind that the gaping of a wound is not an absolute sign of infliction during life.

II. Punctured wounds.—The edges of such wounds should always be carefully examined to see if they are lacerated and irregular or incised. Punctured wounds made by glass or earthenware are generally characterised by the irregularity and unevenness of their edges, and portions of the substance may

be found in them. If a punctured wound be made with a pointed weapon possessing a round blade, such as a stiletto or a butcher's steel, it is not circular in outline. Such a weapon acts as a conical wedge, splitting the tissues, and so producing an aperture which resembles a slit, the direction of the long axis of which is determined by the course of the fibres composing the tissues perforated.

III. Lacerated wounds.—These are produced by the tissues being torn in place of being cut. They are generally the result of accident. The characteristics of lacerated wounds are that the edges are irregular, and present a jagged, swollen appearance. If produced by a blunt-edged object, there is ecchymosis of the surrounding skin, and the tissues beneath are more or less disorganised. If a bone be near the surface, it is liable to be fractured.

IV. Contused wounds.—It is frequently a very difficult matter to decide whether a contused wound has been produced by the employment of a weapon, or by a blow from the fist, or as the result of a fall against some hard surface. In a case of trial for manslaughter, where death has resulted during, or in consequence of, a fight, the question may be put to a medical witness as to whether a particular contused wound was the result of a blow or a fall, or of both kinds of violence combined. It is not always possible to answer this question with certainty. If the contused wound be on the summit of the head, it is very probable that it has been caused by a weapon, since this is not commonly a part which can be injured by a fall such as might occur in a fight. If sand, gravel, grass, or other substances be found in a contused wound, it is highly probable that the injury was caused by a fall. In the case of a fatal contused wound of the head, it has been judicially decided that it does not necessarily make any difference as to the guilt of the accused whether the death of the victim was produced by a direct blow upon the head, or, indirectly, by a fall upon a stone or other hard substance.

It is important to remember that, if a contused wound result

from the infliction of a blow with a blunt weapon upon tissues stretched over a bony surface, such as a blow upon the scalp from a hammer, cricket-ball, or a fall on the ground, the wound sometimes presents the appearance of an incised wound. This is due to the stretched skin being evenly separated or split open. If the wound be a recent one, a careful examination of the edges, especially if a lens be employed, shows that they are not so clean and even as in the case of a cut or incised wound.

V. Stabs.—These wounds generally carry distinctive evidence of their mode of production. One or both extremities of the wound will be found cleanly cut, accordingly as the instrument possessed a single or double edge. If a knife, with a single edge and fairly thick at the back, be used, the opening in the skin is wedge-shaped; one extremity forms the apex, and the other the base of a very acute triangle. If, however, an ordinary knife with a single sharp edge, pointed, and of but moderate thickness at the back, be used to inflict the wound, the edges generally meet at acute angles at the two extremities. This is invariably the case if the knife or dagger be double-edged. As a rule, the length of a stab is apparently narrower than the width of the weapon producing it. This is due to the elasticity of the skin causing a certain amount of contraction of the opening, after the withdrawal of the weapon. If during its withdrawal a lateral motion be given to the weapon, the opening of the stab may be much wider than the weapon. When a stab traverses the body, such as a sword-thrust or bayonet-thrust, the aperture of entrance is commonly larger than the aperture of exit; the edges of the entrance aperture are sometimes everted, owing to the weapon, during its rapid withdrawal, gripping the edges of the opening through the skin, and so everting them.

Stabbing and cutting were, in former times, treated as distinct from wounding, and consequently acquittals were not uncommonly obtained on mere legal technicalities. Under the Consolidated Act, the words 'stab' and 'cut' are omitted, and the word 'wound' only has been retained. A medical witness

has, therefore, now only to show that the injury falls within the meaning of the term *wound*, and is not necessarily required to prove the precise variety of wounding to which the injury should be assigned.

Formerly a good many legal doubts existed as to what really constituted a weapon; these, however, have been removed by statute. The uncovered hands or feet and the teeth were formerly held by judges *not* to be weapons, and injuries produced by them were not treated as wounds within the meaning of the statute.

Examination of the clothing in cases of wounding.—A careful examination of the clothing of a wounded person should always be made, the attention being especially directed to the presence or not of marks of blood, dirt, gravel, grass, &c., on the clothing, and to the presence of cuts or perforations. If the latter are present, it should be seen whether they correspond in position with the wounds on the body. The following case, narrated by Taylor and Stevenson,¹ illustrates the importance of comparing the article of dress with the injuries which may have proved fatal. 'A woman, aged sixty, was found dead in her bed. She had vomited slightly, and there was a small quantity of blood on the floor, which had flowed from her nose. She had been seen in her usual health on the previous night. On inspection, there were found two indentations about the middle of the right parietal bone, and there was a large clot of blood in this situation beneath the skin. On removing this clot, the bone was found fractured to the extent of four inches. Nearly three ounces of dark clotted blood were found between the skull and dura mater. All the other viscera were healthy. This was the only injury, and quite sufficient to account for death; but a question arose respecting the mode in which this fracture was caused. It was in evidence that, on the evening before her death, deceased had been suddenly knocked down, while she was walking in a public road, by a man accidentally running against her. One witness stated that she fell heavily

¹ *Med. Jurispr.*, vol. i.

on the back of her head, on which at the time she wore a bonnet. She appeared stunned, was raised up by the man, some brandy was given to her, and she recovered sufficiently to walk home and eat her supper as usual, after which no one saw her until she was found dead in bed on the following morning. Some suspicion arose that the violence done to the head was too great to be accounted for by a mere fall, and it was a question whether, with such an amount of injury, the deceased could have walked to her home, a distance of a mile and a half, and have eaten her supper before going to bed. At first it was thought that it was a case of murder, and a man who lodged in the house with deceased was suspected. His room was searched, and a hammer with two claws was found. On comparing these claws with the two indentations and fracture, the medical witness thought that this weapon would at once account for their production. Deceased and this man had been in the habit of quarrelling, and they were the only persons in the house on this occasion. It was only at the adjourned inquest that the bonnet worn by the deceased at the time of the fall was called for by the coroner. Two indentations were then found upon the back part of it, corresponding to those on the skull of deceased. The indentations on the bonnet contained dust and dirt, thereby confirming the statements of the witnesses, and rendering it probable that the fall in the road had caused the fatal injury to the head.

‘The examination of the dress, in this case, cleared up what might have been otherwise doubtful. It is probable that the large internal effusion of blood which caused death did not take place until deceased had reached home, and perhaps as a result of the exertion made. She must have died very soon after she went to bed, as her body was found cold at seven o’clock the next morning. In addition to the caution which this case conveys respecting medical opinions on the origin of wounds, it shows that persons may walk and die at a considerable distance from the spot where serious injury to the head has been sustained.’

CHAPTER XXVII

Distinction of homicidal, suicidal, and accidental wounds—Rules for investigating a case of death from violence—Examination of weapons—Causes of death from wounds—Medical responsibility in the treatment of wounds—Malapraxis.

IN order to arrive at a decision as to whether a wound is of homicidal, suicidal, or accidental origin, attention should be especially directed, and very careful consideration given, to the following particulars and details:—

- I. The situation of the wound.
- II. The nature and extent of the wound.
- III. The direction of the wound.

I. The situation of the wound.—Wounds inflicted by a suicide are usually confined to the front or lateral parts of the body. If cutting implements are used by suicides, the wounds are generally found on the throat or chest. If wounds are suicidally inflicted by firearms, the chest, mouth, orbit, and temples are the parts to which the weapon is most frequently directed. Wounds, however, in any of these parts may be of homicidal origin, and, in fact, there is no wound which a suicide can inflict upon himself which may not be produced by a murderer. On the other hand, there are many wounds of homicidal origin which, from their situation, a suicide could not inflict upon his own person. So that the discovery of wounds on a part of the body difficult of access by the individual himself would not be suggestive of suicide. To this statement an exception must be made as regards the insane, who are known to destroy themselves by self-inflicted wounds

of the most astounding character, which may be confined to the back of the head and neck. An insane person has been known to shoot himself with a pistol fired from behind the ear. In the case of suicidal wounds inflicted with firearms, the fingers of the suicide are sometimes discoloured by the explosion of the powder. Wounds that are accidental or suicidal in origin are generally in exposed parts of the body; so that if a wound be found in a part of the body not easy of access, it may be presumptive of homicide. Again, an exception must be made to this statement as regards the insane.

II. The nature and extent of the wound.—Suicidal wounds are generally incised or punctured. With the exception of those cases in which persons commit suicide by throwing themselves from a height, contused wounds are rarely seen in cases of suicide, because, in inflicting them, there is not that certainty of speedy death which a suicide generally desires. To this exception must be made as regards the insane. In some cases of self-destruction by the insane, contused wounds have been produced by butting the head against a wall. Smith¹ relates the case of a man who stood before a looking-glass, and then struck repeated blows on the top of his head with a hammer weighing nearly three pounds. An area three inches in diameter was divested of scalp, and a fracture of the skull two inches in diameter, with a depression of three-quarters of an inch, was produced, the bones being splintered around. It should be carefully borne in mind that the insane frequently inflict upon themselves wounds of so extraordinary a nature, as to lead occasionally, from a mere examination of them, to a suspicion of murder. An insane person has been known to tear open the abdomen with the hands, so as to cause the protrusion of several feet of intestines. An insane pregnant woman has ripped open the abdomen, so that the gravid uterus has protruded. Taylor and Stevenson² describe the case of an insane gentleman who was found lying in a state of insen-

¹ *Med. Times and Gaz.*, 1878.

² *Med. Jurispr.*, vol. i.

sibility in the kitchen of his house, with a cleaver by his side. On examining the head, upwards of thirty wounds were found over the back part of the skull. The wounds, many of which were superficial, had a *horizontal direction from behind forwards*. One, however, had removed a portion of the skull from the middle of the lambdoidal suture, so that some of the brain had escaped. This person died four days afterwards, but recovered so far as to admit that he had produced the wounds on himself, of which, from other circumstances, there could have been no doubt. This was a most unusual way of committing suicide. A case of this kind should be borne in mind when a medical witness is called upon to speak to the possibility of certain wounds, found on a dead body, having been self-inflicted. Staples¹ relates a case of remarkable self-inflicted injuries to the head. A man drove into his head two stone chisels, each eight and a quarter inches long and three-eighths of an inch in diameter, using for the purpose a wooden mallet. One of the chisels was driven through the head from right to left, entering in the right temporal region, and emerging on the left nearly in a direct line, the point projecting an inch and a half, the head of the chisel being close down to the scalp. The other chisel was driven into the centre of the forehead, and penetrated at least half an inch into the frontal lobe. After inflicting the injuries, the man, with the chisels in his head, approached and endeavoured to open a locked glass door, through which he was seen by two persons. When the door was broken open, he walked a distance of forty feet with but little aid, and was able to talk. The chisels were withdrawn with considerable difficulty, and he died about five hours afterwards. Such a case is an important one to remember, since, although repeated blows were struck on the head, and severe injuries were inflicted on the brain, yet the patient not only remained conscious, but was able to talk and walk. Stephens² records an unusual case of suicide, which in the absence of

¹ *Jour. Am. Med. Assoc.*, 1887.

² *Bristol Med. Chir. Jour.*, 1888.

witnesses to the act would have probably given rise to a suspicion of homicide:—A man suffering from melancholia (who not long before had been discharged from an asylum), whilst at work forging nails, made an iron rod, about two feet in length, white hot, and thrust it four or five inches into his abdomen; he died on the following day. Prall¹ records the case of an Indian groom who committed suicide by stabbing himself in the abdomen, inflicting a wound about three inches in length; from this wound some of the small intestines protruded, and the man then had the determination to cut off three pieces of the gut, each about three inches long, and then to push back the remainder of the protruded gut into the abdominal cavity. Maschka² relates a case which is illustrative of the excessive violence that a lunatic may inflict upon himself. A male lunatic, aged fifty-one, who had partially recovered, was allowed the use of a knife for the purpose of cutting an apple. He was afterwards found bleeding profusely from no less than 285 punctured wounds, of which 200 were on the left half of the chest, 50 on the inner side of the left forearm, and 28 on the inner side of the right forearm. The left radial and ulnar arteries were divided. Six of the chest wounds penetrated the thorax, the left lung being compressed by blood collected in the pleural sac. The man survived nearly twenty-four hours, eventually dying from hæmorrhage. Mathie³ relates a singular attempt at suicide, which, on first consideration, led him and Ashley Smith, who saw the case with him, to suspect attempted homicide. A man, aged fifty-eight, was found lying injured at the back door of the kitchen of his house. The forehead showed two ragged wounds, one extending two inches and a half from the root of the nose upwards, whilst, crossing this transversely, was another three inches long. The tissues round the wound were beaten to a pulp, and an area of bone, the size of a crown piece, was exposed. Two transverse fractures were visible on the exposed frontal bone.

¹ *The Lancet*, 1894.

² *Prag. Med. Wochenschr.*, 1888.

³ *The Lancet*, 1890.

The floor of the kitchen was covered with blood, and the walls, ceiling, and furniture were bespattered with it. Small pieces of skin were found on articles lying about the room and on the walls. On the hearthstone lay an axe, weighing three pounds and three-quarters, thickly covered with blood on the handle and blunt end. There was a ring of clotted blood round the middle of the handle, where it had been grasped. In three hours consciousness returned, and the injured man asserted that the wounds were self-inflicted. MacQueen¹ reports the case of a man, aged thirty-five, who was found with four nails driven into his head. The nails were all three-inch French nails; one was sticking from the forehead, and had penetrated the skull about an inch and a half; the other three were driven 'home,' one close to the occiput, one at the top of the head in the middle line, and the third about an inch in front and a quarter of an inch to the left of the middle line. As it was considered doubtful whether he could have driven in the nail in his occipital region himself, the patient was questioned at the time as to who did it, and he answered slowly, but distinctly, 'I done it.' The nails were removed, two of them requiring considerable force for their extraction. There was copious venous bleeding from the nail hole on the top of the head in the centre, and it was considered that the superior longitudinal sinus was penetrated. After a few days the man made a rapid and complete recovery. This is a remarkable instance of an attempt to commit suicide, and, when considered with the cases previously described, indicates the necessity of great caution on the part of a medical witness in forming an opinion as to the impossibility or improbability of certain wounds being self-inflicted. These cases also demonstrate that, after the infliction of severe wounds, consciousness and the power of locomotion may be retained.

Suicidal wounds of the throat are commonly at the upper part. In a large number of cases they are situated between

¹ *The Lancet*, 1890.

the hyoid bone and the thyroid cartilage, and in a smaller proportion of cases between the thyroid and cricoid cartilages, or even below the latter. In many cases the larynx is laid open, but it is not unusual for the large vessels of the neck to escape injury. Death following suicidal wounds of the throat is not always due to hæmorrhage; it may be due to sequelæ, such as inflammation of the lungs, or œdema of the glottis. It has been asserted that extensive wounds of the throat are incompatible with the act of suicide; this, however, is not correct, as suicidal cut-throat cases are known in which all the muscles of the front of the neck, the windpipe, œsophagus, and both jugulars and carotids have been severed, and the anterior ligaments of the spine grazed. Lord¹ reports the case of a man, aged fifty-eight years, who was brought into hospital with a large open wound in the throat, from which he died rather more than an hour after the receipt of the injury. Shortly after his death, his son came to the hospital with something in his hand which he said his father had cut out of his own throat. This was the entire larynx, consisting of the thyroid and cricoid cartilages, and the first and part of the second ring of the trachea. The whole had been cleanly cut out without damage to the large vessels of the neck. Cargill² reports the following remarkable instance of the retention of voluntary power after the division of the great vessels on both sides of the neck. A coloured man, after murdering his sweetheart, entered his house, and cut his throat with a razor. Some of the neighbours, who had witnessed both deeds, rushed into the house, but were unable to find him. After a search, his dead body was found under the house, which was a small one, built on supports, raising it about two feet from the ground. After cutting his throat, the man must have walked or run to the back entrance, a distance of sixteen feet, and then have crept through a hole in the partition, and have crawled on all fours to the spot where his body was found, exactly beneath the

¹ *Trans. Path. Soc. Manchester*, 1892.

² *Brit. Med. Jour.*, 1888.

room where he cut his throat, and, therefore, a further distance of sixteen feet. The throat was cut from ear to ear by a clean sweep, both carotids and jugulars being severed, as well as the trachea and œsophagus, the wound reaching back to the anterior portions of the bodies of the cervical vertebræ. A blood-stained razor, which was deeply notched, was found in the room, and marks of blood were traced from the room to the back entrance by which the man must have gone out. This case is remarkable on account of the retention of so much voluntary power after the division of the great vessels on both sides of the neck. It should serve as a lesson to medical men not to be too dogmatic as to what is, and what is not, possible even in the presence of the most rapidly fatal wound.

✓ III. **The direction of the wound.**—In most suicidal wounds of the throat the direction is from left to right, the wound most often taking an oblique course from above downwards, but occasionally being transverse. In the case of suicides who are right-handed, the wound generally begins on the left side near the angle of the jaw, and terminates on the right side either above or about the level of the thyroid cartilage. In the case of left-handed suicides the direction of the wound is reversed. At the termination of a suicidal cut-throat wound the skin is generally the last structure divided, the wound becoming shallower as it reaches its termination. In homicidal wounds of the throat the termination of the wound is not unfrequently under-cut, the tissues beneath being divided further than the skin. If a murderer cut the throat of his victim when facing him, the wound is from right to left, provided the murderer be right-handed, and is usually more horizontal than suicidal cut-throat wounds. If, however, the murderer stand behind his victim, and then makes an incised wound in the front of the throat, the direction of the homicidal wound may closely resemble one of suicidal origin, since the position and movement of the hand and arm of the murderer are very similar to those of a person inflicting a wound on his own

throat. In such doubtful cases, careful attention should be directed to the surrounding circumstances, such as the position of the body and of the weapon, and the presence or absence of blood and cuts upon the hands of the deceased. If the throat has been cut suicidally, blood will be found on one or other of the hands; if homicidally, and no resistance has been made, the hands will probably be unstained; if homicidally, and the victim has made much resistance, cuts may be found upon the inside of the hands, from the blade of the weapon having been grasped by the victim, and then forcibly withdrawn from the closed hand or hands by the assailant. Very exceptionally cases have occurred of wounds resulting from cutting instruments, where the hands and fingers of the wounded person have been found cut, and which have proved to be cases of suicide or attempted suicide. For instance, Alexander¹ reports the case of an officer who was found with two deep incised wounds on the front of the abdomen, and one on the back near the spine. There were twenty-six wounds about the left breast, some penetrating the thorax. Both hands were dreadfully mutilated. A bent sword covered with blood was lying beside the patient, who survived several hours. He stated that he had endeavoured to transfix himself by placing the hilt of the sword against the wall, and then pressing forward on the point of the blade. On failing he tried a second time, when the blade penetrated the abdomen and impinged on the spine; he withdrew it with great difficulty, his hands being cut in the act of pulling it out. He afterwards attempted to pierce the heart. Although the direction of a cut-throat wound frequently enables a correct opinion to be formed as to its suicidal or homicidal origin, it should be carefully borne in mind that, if the direction be not that which is generally considered to be characteristic of suicidal wounds, suicide should not, therefore, be excluded from consideration, unless the position and direction are such as to make it impossible for the wound to have been self-inflicted.

¹ *The Lancet*, 1885.

Suicidal stabs are, in the case of right-handed persons, generally from right to left and from above downwards. In the case of left-handed people they are generally from left to right. It should be borne in mind that many people are ambidextrous, and that the possession of such a faculty may be unknown even to their intimate friends, who might describe them as having been only right-handed. The occurrence of multiple stab-wounds on the front of the chest, and even implicating the heart, is not necessarily opposed to the view of suicide. For instance, Newnham¹ relates a case of suicidal wounds of the heart where the deceased, a man aged thirty-three, had stabbed himself in six places. Two of the stabs perforated the left ventricle, and three perforated the superficial layers of cardiac muscle. The sixth wound penetrated the thorax, but failed to wound any of the viscera.

Wounds taking an oblique course from below upwards are generally indicative of homicide. Penetrating wounds of the back are very suggestive of homicide, but occasionally they may be due to accident, as when a person falls backwards upon a weapon or other pointed object. Accidental stabs are occasionally produced by a person falling while in the act of running with a pointed instrument in his hand or pocket. In such cases the direction of the stab is commonly from below upwards.

If a body be found with two mortal wounds upon it, either of which is sufficient to have caused death, the question may be raised whether the presence of two such wounds can be compatible with the act of suicide. For instance, can a person inflict upon himself, consecutively, two mortal wounds, such as shooting himself through the brain, and afterwards through the heart? The self-infliction of two such mortal wounds is certainly possible, provided the first one was not instantaneously fatal. It should be remembered that all suicides do not die immediately of wounds which are commonly termed mortal, such as a bullet-wound of the brain or heart; and that after the infliction of one such wound, they not uncommonly have the

¹ *Brit. Med. Jour.*, 1888.

power to perform acts of volition and locomotion, so that ample time may remain for the repetition of the fatal act. Moreover, it is just possible that, after the self-infliction of a fatal wound from a self-cocking revolver, a second discharge may occur unconsciously on the part of the suicide, from his finger being on the trigger at the time. Again, a man may inflict a fatal wound upon himself, and yet retain the power of immediately afterwards precipitating himself from a height. Taylor and Stevenson¹ mention the case of a man who was found lying dead in a street with his skull severely fractured, and his throat cut. The evidence adduced at the inquest showed that the deceased had attempted suicide by cutting his throat in his bedroom, and had then thrown himself out of the window, by which the fracture and other severe contusions had been produced.

Circumstantial evidence.—This may be of extreme importance if the body be examined in the position and at the place where it was found, and careful notes are made at the time. The points especially to be noted are the exact position of the body, the presence of a weapon either in the hand or near the body of the deceased, the direction of the weapon, the marks of blood and presence of wounds about the body, and any indications of a struggle having taken place, such as disarrangement of the clothes of the deceased, marks of blood on surrounding objects, and the presence of footmarks. ✓

DIRECTIONS FOR THE INVESTIGATION OF A CASE OF DEATH
FROM VIOLENCE PREVIOUS TO THE PERFORMANCE OF A
POST-MORTEM EXAMINATION

Attention should be especially directed to the following details, of which careful notes should be made at the time :—

1. The position of the body.
 2. The position of the weapon.
 3. The presence of blood on the weapon.
- ✓

¹ *Med. Jurispr.*, vol. i.

4. The presence of hair and other substances on the weapon.

5. The presence of foreign substances in the wound or wounds.

6. Marks of blood on the clothing, ground, furniture, or other surrounding objects.

7. Footmarks on the ground around the body.

I. **The position of the body.**—This may be such as to be only compatible with homicidal interference, as, for instance, when a body is found doubled up in a box. The exact position of the body in relation to the surroundings should be noted, and a rough sketch of the same should be made.

II. **The position of the weapon.**—This should be noted before anything is disturbed. If death has occurred speedily from a suicidal or accidental wound inflicted with a weapon, the weapon is generally found near the body, or within a short distance of it, or in the hand of the deceased. If near, the side of the body on which it is lying should be noted; if at a short distance, an inference should be formed as to whether it might have been thrown or placed there by the deceased, or have fallen there after the infliction of the wound. It is quite compatible with suicide that the weapon may be at some distance from the body, or concealed, or, if a knife or razor, that it may be closed. Casper mentions the case of a man who cut his throat with a razor, which was found, bloody and *closed*, two feet distant from the body. Also of a man who shot himself in the breast, the pistol being afterwards found in his pocket, and who then terminated his life by drowning himself. If a weapon be found firmly grasped in the hand of the deceased, it is strongly confirmatory of suicide. If the weapon cannot be found, or be found at some distance, it is presumptive of homicide, provided the wound or wounds are of such a nature as to prove quickly fatal.

III. **The presence of blood on the weapon.**—It is not by any means essential that the weapon with which a fatal wound has been inflicted should be covered with blood, although there is a

popular notion that, if much blood be found about a corpse, the weapon should be considerably blood-stained. If death has been caused by violence inflicted on the head by some heavy blunt instrument, there need not necessarily be any blood upon the weapon, as severe contusions and fractures of the bones may be produced without an immediate effusion of blood.

If death has been caused by a stab or stabs, the blade of the weapon is frequently found without any marked stains of blood upon it, even when no attempt has been made to remove the stains by wiping or washing the blade. The reasons for this are—(a) that in a rapid plunge, the blood-vessels that are cut through are compressed for the moment, so that bleeding does not take place to any considerable extent till the weapon is withdrawn, and (b) that during the withdrawal of the weapon, the blade is more or less wiped by the edges of the wound, owing to the elasticity of the skin; if the stab has been inflicted through the clothing, the blade during its withdrawal is more thoroughly wiped, and more likely to be free from blood. The actual colour upon the blade, if a very thin film of blood adhere to it, is frequently yellow rather than red.

IV. The presence of hair and other substances on the weapon.—In some instances, if the weapon be of a bruising or cutting kind, some hairs or fibres may be found on it, or imbedded in coagulated blood upon its surface. These hairs or fibres should be removed and examined under the microscope; if imbedded in blood-clots, they should be removed by digestion of the clots in water. The appearances, as seen under the microscope, of the various fibres met with in articles of clothing, are shown in figs. 26–29.

V. The presence of foreign substances in the wound or wounds.—In gunshot wounds a careful examination of the wound for wadding or paper should be made. This proceeding was more especially useful in former days when muzzle-loading guns were entirely in use, as occasionally it has led to the detection of a murderer by the discovery in his possession of written or printed paper from which the portion used as

wadding had been torn. Any projectiles found in a gunshot or pistol wound should always be preserved.

✓ VI. **Marks of blood on the clothing, ground, furniture, or other surrounding objects.**—Careful examination of the clothing, furniture, walls, ground, and surrounding objects should be made for blood stains. If the blood has spurted on to some object from a distance, which can only occur with hæmorrhage from small arteries, it may take the form of a number of small spots forming a line, or perhaps of a confused mass with some spots around it. Indication of spurting is a sign that the wound was inflicted during life. Marks left by blood-stained fingers on walls, furniture, &c. should be minutely examined, and if the impression show the course of the papillary ridges, the substance bearing the impression should be removed and preserved. According to Galton, such an impression, if made by a murderer, may serve as an aid to identification, as it can be compared with an impression taken from the same finger of the suspected person, the finger being first pressed on a slab freshly covered with a thin layer of printer's ink, and afterwards on white paper. Galton states that the papillary ridges on the inner surface of the hands afford twenty-five to thirty distinct points of reference, every one, with the rarest exceptions, being absolutely permanent, and persisting throughout life. The hands of the dead person should be examined for cuts or excoriations, which may be indicative of a fierce struggle with the murderer.

✓ VII. **Footmarks on the ground around the body.**—A careful examination should be made for footmarks on the ground or floor around a body. If much blood has flowed on to the floor or ground, the murderer may have possibly trodden in it, and so leave blood-stained footmarks. As a suicide, after the infliction of a fatal wound and previous to the occurrence of death, may have trodden in some of his own blood and so have left blood-stained footmarks, the soles of the feet of the deceased should be examined.

CAUSES OF DEATH FROM WOUNDS

The cause of death from a wound or wounds may be **immediate** or **remote**; in other words, a wound may prove either directly fatal or indirectly fatal.

1. IMMEDIATE OR DIRECT CAUSES OF DEATH
FROM WOUNDS

- I. *Hæmorrhage.*
- II. *Severe mechanical injury to a vital organ.*
- III. *General shock, or concussion affecting the brain or spinal cord.*

I. **Hæmorrhage.**—Death from hæmorrhage alone is due to fatal syncope. The rapidity of death depends upon the amount and suddenness of the bleeding. Exhaustion occurs much more rapidly from a sudden hæmorrhage than from a more copious flow of blood that is gradually lost. Moreover arterial hæmorrhage is more rapidly fatal than venous. A small quantity of blood, which by its escape from the circulation would be insufficient to produce fatal syncope, may yet cause death by compression of some important organ. For instance, a small quantity of blood effused upon the surface of or into the substance of the brain may cause death by compression, and a few ounces of blood effused into the pericardial cavity will entirely arrest the action of the heart. In connection with death from hæmorrhage, it must be borne in mind that persons who are subject to hæmophilia or the hæmorrhagic diathesis have a tendency to excessive bleeding from slight injuries. Such persons are known as 'bleeders.' The condition is often hereditary, and with such persons fatal hæmorrhage may result from such slight wounds as those caused by the extraction of a tooth or the bite of a leech. If such a person should bleed to death from what would, with the majority of individuals, be a

simple wound or injury, the condition might possibly lessen the responsibility of an assailant.

II. Severe mechanical injury to a vital organ.—Instances of death from this cause are the crushing of the heart, lungs, or brain in a railway or other accident. Death is due either to hæmorrhage, or to shock, or to both combined. Sometimes the severe mechanical injury is accompanied by a copious loss of blood; death is then mainly due to hæmorrhage. On other occasions the loss of blood is very slight; death is then mainly due to shock.

III. General shock, or concussion affecting the brain or spinal cord.—Shock is the result of a violent impression made on the great nerve centres. In all probability it causes death mainly by paralysis of the heart. Death from shock generally follows extensive lacerations of the body, such as result from machinery and railway accidents, or from extensive burns. Death from severe crushes, lightning, and blows in the pit of the stomach are also due to shock. Persons may die from shock to the system without any physical injury being visible. This has occurred on several occasions in railway collisions, after severe frights, and after blows in the pit of the stomach. This fact should be borne in mind by a medical witness, as counsel for the defence of an accused person will often argue that the absence of any visible physical injury to account for death is a proof that no injury could have been inflicted.

Death may occur from shock caused by the infliction of a number of injuries, each of which may be comparatively trivial, but which together are capable of producing a fatal result. Deaths from flogging, kicks, and repeated blows are instances of this form of death. In such fatal cases as these, the medical witness may be asked which of the several bruises or wounds found on the body of the deceased was responsible for the fatal event. The answer would probably be, that not one injury alone, but all collectively, caused death by general shock to the system.

2. REMOTE OR INDIRECT CAUSES OF DEATH FROM WOUNDS

A person who recovers from the immediate effects of a wound may eventually die from remote or indirect causes. The remote or indirect causes of death from wounds are the following:—

- I. *Inflammation of the wound and fever.*
- II. *Septicæmia.*
- III. *Pyæmia.*
- IV. *Erysipelas.*
- V. *Delirium tremens.*
- VI. *Tetanus.*
- VII. *Gangrene.*
- VIII. *A fatal result following an operation required during the treatment of a wound.*

Should death occur from any of these causes, consequent upon the infliction of a wound or wounds, the assailant may be held by the law as much responsible for the result as if the wound or wounds had proved directly fatal. This is only just, as otherwise many reckless criminals would escape. The principle laid down by the law is that when a man criminally wounds any person, he must abide by the full consequences of the act. If, for instance, an injured person die of erysipelas, which is consequent upon the wound, then his death is traceable to the violence inflicted on him, and, therefore, the assailant is answerable for his death. It is the law of England that, when a person dies from a wound, the assailant shall not be adjudged guilty of murder, unless death take place within *a year and a day* after the infliction of the wound. Supposing, however, that a trifling wound only has been inflicted, and yet death subsequently occurs on account of some constitutional peculiarity, such as the hæmorrhagic diathesis, or on account of a diseased condition from acquired habits of dissipation predisposing to delirium tremens, then an acquittal of the assailant is not unlikely to be the result.

Tetanus as a complication or sequela of a wound is generally

the result of punctured and lacerated wounds. Traumatic tetanus is much commoner than the idiopathic variety, and as a very slight wound may be followed by fatal tetanus, careful search should always be made in cases of tetanus for slight injuries. The puncture of the sole of the foot with a nail, or the slight wound resulting from a splinter of wood being driven under the nail of a finger or thumb, may be followed by tetanus. An instructive case is mentioned by Taylor and Stevenson¹ which exemplifies the necessity of making a rigorous enquiry into all the attendant circumstances of an attack of tetanus. A boy, aged fifteen, while quarrelling with another, received a blow in the back from his companion's fist, and this was followed by a kick, but not of a severe character. He was able to get up and walk home, but in about two hours he complained of stiffness of the lower jaw. He passed a restless night—the stiffness increased, there was great pain, and subsequently difficulty in swallowing. On the second day he was admitted into hospital, the pain and stiffness gradually increased, and the jaw became partially fixed. Spasms of the muscles of the back supervened, occurring in paroxysms, and there was confirmed tetanus. He died on the fourth day after he had received the blow on the back, apparently from tetanus, as a result of that violence. It turned out, however, on enquiry, that six days previously to the first appearance of the tetanic symptoms, the boy had accidentally driven a rusty nail into his foot, and that the suppurating wound which resulted from this injury had only closed on the day on which the blow was inflicted. On an examination of the body, a small puckered cicatrix, such as would result from the healing of a punctured wound, was found on the ball of the great toe, and there could be no doubt from the circumstances, that this, and not the slight blows struck by the assailant, had been the cause of the fatal attack of tetanus.

Erysipelas may also be a fatal result of slight wounds. Erysipelas is especially prone to occur as a complication of

¹ *Med. Jurispr.*, vol. i.

wounds of the scalp. It should be borne in mind that some persons are particularly liable to erysipelatous inflammation, and that with them very slight wounds may lead to a fatal attack of erysipelas.

MEDICAL RESPONSIBILITY IN CONNECTION WITH OPERATIONS REQUIRED DURING THE TREATMENT OF WOUNDS

When death follows an operation required during the treatment of a wound, the question may be raised as to whether the assailant who inflicted the wound should be held responsible for the fatal event. The law of England regards a necessary surgical operation as part of the treatment of a wound, and if it has been undertaken by the operator as being essential to the cure of the patient, and has been performed by him with *reasonable care and skill*, then the assailant will still be held responsible, whatever may be the result of the treatment, provided always that the medical attendant has brought his best ability to bear upon the case. It is evident, therefore, that a serious responsibility is thrown upon medical men who undertake the treatment of cases of criminal wounding. As the suggestion is not uncommonly made by counsel defending an assailant that the operation was either unnecessary to the treatment, or was performed in an unskilful manner, it is always advisable for a medical man, who has the management of such a case, to seek the advice and assistance of, at least, one other medical man before undertaking an operation. If a fatal result occur from the operation, the law exonerates medical men if, in their opinion, the operation was absolutely necessary to save life, and if reasonable care and skill had been given to its performance.

If a wound be not originally of a fatal character, and a fatal result be caused by unskilful or careless treatment, the assailant is relieved of responsibility for the fatal event. It has been laid down that, if death take place from an *unskilful operation*, performed for the cure of a wound, and not from the wound

itself, then the responsibility of the prisoner for the fatal event ceases. For example, if, after the receipt of a wound, amputation of a limb be necessary, and if the operating surgeon failed to properly ligature a large artery so that, owing to the subsequent slipping of the ligature, death takes place from hæmorrhage, then the assailant could not, in equity, be held responsible for the death, as it would be attributing to him a fatal event which was caused by the unskilfulness and carelessness of the operating surgeon. The same rules apply to the use of anæsthetics in the performance of surgical operations for the treatment of wounds. The only medico-legal questions that could be raised, in the event of death occurring from the administration of the anæsthetic, would be:—Was its administration a necessary and proper part of the treatment, and was it administered with reasonable care and skill?

MALAPRAXIS

By malapraxis is meant, want of reasonable skill or care on the part of a medical practitioner, whether qualified or not, on account of which the person under treatment sustains damage to health, life, or limb. Should the death of a patient occur as the result of gross ignorance or criminal inattention on the part of a practitioner, then he is liable to be adjudged guilty of manslaughter. Faults, such as omissions, errors of judgment, or mistakes in diagnosis, are not visited with this degree of culpability. Taylor and Stevenson quote the following case of *Reg. v. Dickinson* (Stafford Lent Ass., 1846), which was a trial for malapraxis. A medical practitioner was charged with having caused the death of the deceased during her confinement. The case appears to have been one of placenta prævia; the placenta was removed, but the female died from the bleeding that followed. Platt B., after consulting several medical works, charged the jury, that if, in a particular case, there are two modes of treatment, respecting the adoption of either of which men of learning are equally divided, then no man can be said to be 'grossly

ignorant' in adopting a course which has received the approbation of eminent writers, and which his own judgment sanctions and approves. The accused was immediately acquitted. Even if death be not the result of the medical treatment, yet an action for damages may still be brought against the practitioner for malapraxia.

CHAPTER XXVIII

Wounds not immediately fatal—Injuries and wounds of the head, spine, chest, and abdomen—Fractures of bones—Wounds produced by fire-arms—Cicatrization of wounds.

SEVERE WOUNDS NOT IMMEDIATELY FATAL

It was formerly believed that every wound that penetrated the heart must, of necessity, prove instantaneously fatal. This, however, is incorrect, as the following cases, in which persons have survived for varying periods of time after the infliction of wounds of the heart, will show :—(i) A man, after being stabbed in the right ventricle, ran eighteen yards. He then fell, and died in six hours. At the post-mortem examination a wound was found in the wall of the right ventricle in an obliquely transverse direction, which had divided in its course the coronary artery. The pericardial cavity was nearly filled with blood. (ii) In 1879 a boy was admitted into Guy's Hospital with a bayonet-wound, which had penetrated the front wall of the right ventricle. The bayonet had then pierced the septum, entered the left ventricle, pierced the mitral valve, and entered the left auricle. The boy survived for forty-two hours, but was in an unconscious state most of the time. (iii) A man, aged thirty-eight, discharged two pistols into his chest on the left side. He lived for one hour and a quarter after the infliction of the wounds, and was able to talk about his condition. At the post-mortem examination it was found that both bullets had completely traversed the heart ; one bullet had entered the right ventricle, passed through the septum, and left the heart at the junction of the left auricle with the ventricle. It then traversed

the upper lobe of the left lung, and was found embedded in one of the vertebræ. The second bullet perforated the ventricle, and then traversed the left lung. (iv) A man lived for eleven days after receiving a bullet-wound of the heart. Soon after receiving the wound he became senseless and collapsed, but rallied at the end of four hours, and lived for eleven days. At the post-mortem examination a bullet was found lodged in the septum between the two ventricles, about midway between the apex of the heart and base of the ventricles. The wound had entirely cicatrised, and death was due to pericarditis, accompanied by copious effusion. (v) A boy lived for five weeks after his heart had been pierced by a wooden peg three inches long. (vi) Christison has recorded a case of a man wounded by a bullet, which found its way into the right ventricle of his heart, and remained there for two years, occasioning him no trouble; he eventually died of pleurisy. (vii) Christiani¹ has recorded the case of a man, aged twenty-five, who lived thirty-nine days after having received an incised wound in the heart. He was stabbed in the chest in several places during a brawl; the wounds cicatrised, and about five weeks after receiving the injuries he walked a distance of about eight miles. On the return journey he climbed a tree in order to get a bird's nest, and on coming down fell to the ground and died in ten minutes. At the post-mortem examination it was found that one of the stabs had deeply wounded the wall of the left ventricle, without actually penetrating into the cavity. The effort of climbing the tree, after the relatively severe exertions previously undergone, had burst open the partly closed wound, and broken down the frail barrier which was left between the ventricular cavity and the outside of the heart. All these cases show that the walls of the heart may be fairly tolerant of injury so long as no great amount of hæmorrhage occurs.

As an instance of the fact that fatal hæmorrhage may occur from a very small perforation of the heart, Thomson² records a case of suicidal wound of the heart with a pin. The head of the

¹ *Lo Sperimentale*, 1889.

² *Brit. Med. Jour.*, 1888.

pin was discovered in the fifth intercostal space. The pin had passed through the walls of the left ventricle, producing a small rent in the wall. The pericardium contained seventeen ounces and a half of bloody fluid.

With regard to bullet or gun-shot wounds of the brain, immediate loss of consciousness usually follows the passage of a bullet through the brain, but this immediate insensibility does not necessarily take place in every case. Moreover, bullet-wounds of the brain are not necessarily immediately fatal. Tefft¹ relates the case of a boy, aged twelve, who was shot with a pistol in the left frontal region, the bullet traversing the brain and lodging within the skull, in the left occipital region, whence it was removed by trephining. The boy regained consciousness, but finally died comatose on the twelfth day after the injury. Several cases of recovery after bullet wounds of the brain have been recorded, the bullet, in some of the cases, remaining within the cranial cavity.

Wounds of the carotid arteries are frequently considered to be instantaneously mortal, and it has not unfrequently been stated that the exercise of voluntary power and locomotion is impossible after division of both carotid arteries. This is not necessarily the case. On p. 39 is the account of a case in which a man, after severing both carotids and jugulars, as well as the trachea and œsophagus, walked or ran a distance of sixteen feet, and then crawled on hands and knees a further distance of sixteen feet. In the case of *Rex v. Danks* (Warwick Lent Ass., 1832) it was proved that the deceased had died from a wound in the throat inflicted by the prisoner; the wound divided the trunk of the carotid artery, the principal branches of the external carotid, and the jugular veins. The evidence rendered it probable, if not certain, that, after the infliction of this wound, the deceased had been able to run twenty-three yards and climb over a gate—the time required for the performance of such acts being, at least, from fifteen to twenty seconds.

¹ *New York Med. Record*, 1894.

WOUNDS IN DIFFERENT REGIONS OF THE BODY

INJURIES OF THE HEAD

Wounds of the head.—Scalp wounds are not as a rule attended with danger, except when erysipelas supervenes, or when the blow has been so severe as to produce concussion of the brain or intracranial hæmorrhage. It should be remembered that fracture of the skull may exist without any wound of the scalp, and that fatal effusion of blood upon the surface of the brain, or into its substance, may result from a blow on the head without causing either a wound of the scalp or a fracture of the skull. ✓

Injuries to the skull may be dangerous to life either directly or indirectly. Directly, by producing compression of the brain, either by a depressed fracture of the skull or by intracranial hæmorrhage; the symptoms of cerebral compression are total insensibility, pupils not reacting to light (they may be either dilated, contracted or unequal), slow laboured breathing, and slow pulse. Indirectly, by the injury to the skull leading to inflammation of the diploë, and so to septicæmia. In persons possessing degenerated cerebral vessels, as aged people and habitual drunkards, the vessels are liable to rupture either from the receipt of comparatively slight injuries to the head, or even from excessive mental excitement. It should be remembered that many instances have occurred in which cerebral hæmorrhage, either traumatic or idiopathic in its origin, has commenced and produced a certain degree of unconsciousness; the bleeding has then stopped for a time, and the patient has regained consciousness, but only for the hæmorrhage, from the same source, to be renewed and to lead to a fatal termination a few hours later. The case described on p. 32 was probably one of this nature. ✓

Concussion of the brain.—This may result either from a direct blow upon the head, or from a severe fall upon the feet

or buttocks. Death may ensue immediately from concussion of the brain, leaving behind it no lesion perceptible at the post-mortem examination, though probably some molecular disorganisation of the nerve cells has occurred, which is not recognisable by means of the microscope. The symptoms of severe and fatal cases of concussion are loss of consciousness, pallor of the face and coldness of the surface, irregular respiration, and feeble or imperceptible pulse; there is frequently more or less vomiting. Concussion of the brain is apt to be confounded with alcoholic intoxication, opium poisoning, and some other forms of coma. The distinction from alcoholic intoxication is very important, for medico-legal reasons, as, doubtless, many cases of supposed drunkenness, arrested by the police at night and left unattended in the cells till the morning, are in reality cases of concussion or compression of the brain, which, for want of suitable medical assistance at the time, may prove fatal. For the distinction of unconsciousness due to concussion of the brain from that due to alcoholic intoxication, opium poisoning, and other forms of coma, see vol. i. p. 233. The primary shock from concussion may be followed by inflammation and suppuration, and so death may occur weeks, or even months, after the receipt of the injury. Less severe cases of concussion usually end in recovery.

Fractures of the skull.—These may result from a direct blow upon the head, or from a fall upon the head, or from a fall from a height upon the feet or buttocks. If a fracture be caused by a severe blow or blows with a heavy weapon, the striking-surface of which is of limited area, such as a narrow-headed hammer, it frequently displays the shape of that part of the weapon which came in contact with the skull. If the same weapon be used with a lesser degree of force, it may produce an irregularly depressed fracture, and the surrounding bone will probably be fissured.

The elasticity of the skull plays a considerable part in determining the direction of fractures of the base and of the vault of the skull when caused by blows or by sudden pressure,

as when the head is squeezed between two large objects. Körber¹ divides such fractures of the skull into two groups:—
(i) Those produced by bi-lateral compression of the skull; and
(ii) those resulting from violence applied to one side of the skull only, the other side being unsupported, so that the head is free to recede from the impact of the blow. In both groups the line of fracture runs parallel with the axis of compression.

I. *Fractures of the skull produced by bi-lateral compression.*
In this group are included (a) fractures produced by the skull becoming interposed between two opposing forces, both in motion; (b) fractures produced by a blow or blows on one side of the head, the other side being prevented from receding by support of some kind; and (c) fractures resulting from blows on the top of the head when the individual is in the erect position; the counter-pressure is then derived from the resistance offered by the vertebral column. Körber records several cases of fracture of the skull as illustrative of his views. In one case, a woman while asleep with the right side of her head on a pillow was killed by being struck with a wooden mallet near the left ear; the line of fracture ran across the base of the skull from ear to ear. In another case, a man sleeping on his right side received a severe blow near the left eye; the skull was found to be fractured diagonally through the base, from the left orbit to the right parietal eminence. ✓

II. *Fractures of the skull produced by one-sided violence only.*—These fractures result from violence applied to one side of the head only, the head being free to recede from the impact of the blow. The fracture begins at or near the point of impact, and runs parallel with the axis of compression, seldom going beyond the middle line. ✓

At a post-mortem examination of a case of fractured skull, the thickness of the skull bones should always be noted, as occasionally they are exceptionally thin, and so liable to fracture from slight blows. Such excessive thinness is often pleaded as an extenuation of the responsibility of an assailant. It should

¹ *Deutsche Zeitschr. f. Chirurgie*, 1889.

also be remembered that a person may be struck and knocked down by an assailant, and that a fracture of the skull may be produced by the impact of the head with hard ground or pavement. Severe fracture of the skull may be sustained, accompanied by depression of the fractured bone, and yet consciousness and the power of movement may be retained. So that in cases where a dead body is found with severe injuries inflicted on the skull, a very guarded opinion should be given as to whether consciousness and power of locomotion were lost immediately upon receipt of the injuries. The necessity for this is well illustrated by the two following cases reported by Agnew.¹ A man was run over by a tramway-car; he got up immediately after the accident, walked a short distance to his house, opened the door with a latchkey, went upstairs to his bedroom on the second story, and got into bed, where, on the following morning, he was found insensible with portions of the parietal and temporal bones deeply driven into the brain. In the second case, a man had half of the frontal bone, with a considerable portion of the pre-frontal lobes, carried away by the breaking of a fly-wheel; he was dazed for a few moments only, and eventually made a good recovery.

INJURIES OF THE SPINE

Wounds of the spine are dangerous in proportion to the degree in which the spinal cord is involved. The regions most liable to injury are the cervical and the upper lumbar. If the spinal cord be damaged high up, above the origin of the phrenic nerves, the function of respiration is quickly arrested, and death ensues. In fracture of the vertebræ, the principal danger arises from pressure on the spinal cord. Sudden death has been produced by luxation of the second cervical vertebra, due to fracture of a diseased odontoid process. In concussion of the spine, death sometimes takes place instantly, but in milder cases of concussion, such as might result from the shake of a

¹ *Medical News*, 1887.

railway collision, symptoms may take days or even weeks to develop. The symptoms are very variable, and may include more or less paralysis of the legs, difficulty of stooping, enfeebled power of micturition, various paræsthesiæ, loss of memory, irritability, and disturbances of sight and hearing.

Fractures of the spine may be due to direct or to indirect violence. The latter may result from forcible bending of the body forwards or backwards, and usually occurs in the cervical or dorsal regions. It is of medico-legal interest to bear in mind that fracture accompanied by dislocation of the upper cervical vertebræ is not necessarily immediately fatal. Eve¹ records a case in which the patient lived two hours and a half after fracture of the odontoid process, with forward displacement of the atlas which compressed the cord. Gurling² records a case in which the patient lived for twenty-eight hours after fracture of the first three cervical vertebræ, although the cord was injured at the level of the third vertebra.

INJURIES AND WOUNDS OF THE CHEST

Wounds of the chest may be divided into those which are confined to the walls and those which penetrate the cavity of the thorax. Stabs of the chest walls which do not penetrate the thoracic cavity are not as a rule dangerous. Contused wounds of the chest are more dangerous on account of the liability to fracture of the sternum or ribs, and the danger of rupture of the thoracic viscera, with consequent hæmorrhage, or the production of subsequent inflammation of the lungs. Severe blows inflicted on the chest over the cardiac region with an object of large area may cause sudden death without leaving any indications of injury. Penetrating wounds of the chest are dangerous on account of the liability to injury of the heart, great vessels, and lungs, and the consequent internal hæmorrhage that generally follows. They are, however, not necessarily fatal, unless a vital part has been injured. Wounds of the

¹ *St. Barth. Hosp. Rep.*, 1887.

² *Lond. Hosp. Rep.*, vol. i.

heart nearly always terminate fatally, but the fatal event is not necessarily immediate. On pp. 54 and 55 several cases are described of penetrating wounds of the heart, which did not prove immediately fatal. The suddenness of death in severe wounds of the heart is not due to hæmorrhage alone, but is hastened by the blood effused into the pericardial cavity compressing the heart and so arresting its action. In very exceptional cases life has been prolonged for years after a wound of the heart. West¹ records the case of a man who was stabbed with a knife, the injury being followed by profuse hæmorrhage and great collapse; he recovered and lived for four years. After death, a linear cicatrix was found in the wall of the right ventricle; probably the wound had not penetrated the cavity of the ventricle.

It should be borne in mind that persons who have received severe wounds of the heart, which have proved speedily fatal, have yet been able to perform various acts of locomotion after the receipt of the injuries. Fischer² mentions among other cases the following instances of volitional actions after the infliction of such wounds. One person ran 450 paces; another mounted several steps; another walked a mile and a half; and another (in whom the right ventricle, coronary artery, lung, diaphragm, liver, stomach, spleen, and colon were wounded with a sabre), made ten steps before he fell. The heart is liable to be ruptured by natural causes, such as violent mental emotions (anger, fright, &c.), and sudden or severe muscular efforts. If the heart be diseased, and especially if the walls are in an advanced state of fatty degeneration, it is liable to rupture from comparatively slight causes of excitement.

It is to be remembered that the lungs may be lacerated, as the result of external violence, without the ribs being fractured. A boy was run over by a cab, and died the following day; the ribs were uninjured, but the lung was extensively lacerated, and the pleural cavity was full of blood.

¹ *St. Thomas's Hosp. Rep.*, vol. i. n.s.

² *Langenbeck's Archiv.*, ix.

INJURIES AND WOUNDS OF THE ABDOMEN

A superficial incised or punctured wound of the abdominal walls may prove fatal, by the epigastric artery having been divided. Again, a superficial wound may lead to inflammation, followed by suppuration within the sheath of the muscles, or the inflammatory process may extend to the peritoneum, and a fatal result may ensue from peritonitis. Even if the wound of the abdominal walls should heal successfully, there is always a liability to the production, at a future time, of a ventral hernia. If the wound has involved the muscular fibres transversely to their course, the cicatrix is especially liable to yield and allow of the production of a hernia, which may at any time become strangulated, and so lead to a fatal event. A severe blow upon the epigastric region has frequently produced sudden death, probably from shock to the solar plexus reflexly causing paralysis of the heart. In such cases, not the least trace of injury may be discovered, either externally or internally. Blows upon any part of the abdomen, when they do not kill by shock or by rupture of a viscus, may be followed by peritonitis, which may end fatally.

Injuries of the stomach and intestines.—Wounds of the stomach and intestines are very dangerous, and are frequently fatal, either from hæmorrhage, or inflammation, or escape of the contents into the peritoneal cavity. Any of the abdominal viscera may be ruptured from violence without any external signs of injury. The stomach is rarely ruptured; the intestines more frequently so. Such injuries are invariably fatal, although after a rupture of the intestines the injured person may be able to walk a considerable distance. Wounds of the small intestines are more dangerous than those of the large intestines.

Injuries of the liver.—Of all the abdominal viscera, the liver and spleen are the most liable to rupture, on account of their compact structure, which prevents their yielding to a sudden shock. The liver may be ruptured by pressure, as in

the case of a person being run over by a vehicle, or receiving a blow or kick. From any of these causes the liver may be extensively ruptured, without there being any external marks of violence. It is possible for the liver to be ruptured by a sudden powerful contraction of the abdominal muscles, an accident which is more liable to occur if the organ be in a diseased condition. After slight rupture of the liver recovery may take place. It is possible for a person suffering from a ruptured liver to exercise the power of locomotion.

Injuries of the spleen.—As previously mentioned, the spleen is an organ liable to rupture from violence. If it be in a softened condition from disease, it may be easily ruptured by comparatively slight muscular exertion.

Injuries of the bladder.—Ruptures of the bladder may be produced by blows, and when such is the case, they are rarely accompanied by any external marks of violence. With the exception of a rupture of the bladder accompanying a fracture of the pelvis, a traumatic rupture is the result of violence applied to the part while the bladder is *distended* with urine. Such an accident is liable to occur to a drunken man, who, reeling about with a full bladder, may meet with a fall sufficient to cause a rupture of the organ. The injury is practically always fatal when the intra-peritoneal portion of the bladder is ruptured, and very few recoveries take place when the rupture occurs in the extra-peritoneal portion. Locomotion is possible after even an extensive rupture of the bladder. Spontaneous rupture exceptionally occurs from over-distension of the bladder—due to paralysis of its walls, or to obstruction in the urethra from stricture or other causes—and from weakening of the walls from ulceration or other disease. The still rarer event of spontaneous rupture of the bladder, without the existence of any pathological condition to explain it, has been recorded.

FRACTURES OF BONES

From the medico-legal point of view it is important to remember that certain diseases affect bones, which render

them more brittle, and so predispose to their fracture from comparatively slight violence. Such diseases are syphilis, rickets, cancerous and sarcomatous growths, mollities ossium, and certain diseases of the nervous system, such as locomotor ataxy and general paralysis of the insane, which lead to trophic changes in the bones, and a diminution of their inorganic constituents. In such diseased conditions, and even occasionally when there is no appearance of disease, a bone may be fractured spontaneously by muscular exertion. The patella is particularly liable to this accident. In fractures arising from this cause there would be no abrasion of the skin, or other signs indicative of a blow having been struck. It is very unusual for the ribs to be fractured from muscular exertion, but such a case has been recorded.

From time to time complaints are made of the use of apparently excessive violence by attendants at lunatic asylums, as evidenced by several ribs of a lunatic being found fractured. Unnecessary violence may have been resorted to, but it should be borne in mind that the bones of a person suffering from general paralysis of the insane may be excessively brittle owing to the occurrence of trophic changes in them, so that they may become fractured by the employment of only slight force.

With regard to the question that may be put, whether a particular fracture was caused by an accidental fall or blow, and, if by a blow, whether it was caused by a weapon or not—such a question can only be decided on general grounds, such as by paying attention to any marks of superficial injury and to the position of the fracture. Another question that may require solution, is whether a fracture had been produced before or after death. If the person had lived for several hours or days after the infliction of the fracture, then the effusion of lymph into the surrounding structures, and the later evidences of commencing repair, would surely indicate that the fracture had been produced during life. But a fracture produced shortly before death, and one produced shortly after death, while the body is still warm and the blood uncoagulated,

resemble one another, except that in the former case there may be more blood effused. If the fracture has been caused a few hours before death, there may be a copious effusion of blood ; if caused several hours after death, there will be no blood effused.

WOUNDS PRODUCED BY FIREARMS

Gunshot wounds are of the contused kind. They differ from other wounds in that the vitality of the part struck by the bullet or shot is destroyed, so that sloughing of the wound ensues. Gunshot wounds are dangerous to life, especially if they penetrate any of the great cavities of the body. Death may take place directly, either from hæmorrhage or shock, or indirectly from septicæmia, pyæmia, erysipelas, gangrene, or from an operation required in the treatment of the wound. Hæmorrhage is seldom great, except when large vessels are wounded. Occasionally the external hæmorrhage may be slight, while fatal bleeding is occurring internally. Gunshot wounds differ much in appearance, according to the distance from which the piece was fired, the nature of the projectiles, and accordingly as one of the old-fashioned or one of the new-fashioned rifles was employed.

When a small conico-cylindrical bullet passes with high velocity through the body or one of the limbs, there may not be much difference in appearance between the entrance and exit wounds, especially if the bullet has only passed through soft structures. If, however, the bullet has been fired from an old-fashioned rifle at a moderate distance, but with sufficient velocity to pass through the body, then there are marked differences presented by the orifices of entrance and exit. The **entrance wound** is well defined, the margins being usually slightly inverted and ecchymosed, round or oval in shape (accordingly as the bullet entered straight or obliquely), and the surrounding parts do not, as a rule, present any marks of bleeding. The **exit wound** is larger than the entrance wound,

and irregular in shape, the edges are everted, and the skin is usually lacerated. The greater size of the exit wound is due in part to the bullet carrying before it the débris of the tissues through which it crushes, in part to diminution of its velocity, and in part to want of support of the skin at the point of exit.

The less the velocity with which a bullet is travelling, provided it has sufficient momentum to penetrate, the larger and more lacerated will be the entrance wound. If the firearm be discharged in close contact with the body, or at a distance of a few inches only, the wound is blackened and burned by the smoke and partially-consumed or undeflagrated grains of powder that are driven into it. The burning of the skin may also be due to the flame from the mouth of the firearm, which may also scorch or set fire to the clothing and hair in the vicinity of the wound. If the explosive used in the firearm be one of the new smokeless powders or nitrocellulose compounds, there can be no blackening of the wound from smoke or undeflagrated powder, although there may be scorching or burning of the clothing or hair by the flame from the mouth of the firearm, if it has been discharged in close proximity to the wounded person. If the muzzle of the firearm has been in actual contact with the surface of the body at the moment of discharge, the entrance wound will be freely lacerated and ecchymosed in addition to being burnt.

It occasionally happens that the exit-wound is opposite, or nearly opposite, the entrance-wound, and yet the bullet has not passed through the body. This is due to its being deflected beneath the skin, and then making a semi-circuitous course between the skin and the muscles to the back, where it emerges. In this way, it is not uncommon for a bullet, if fired obliquely, to travel half way around the chest or abdomen, and either lodge in the back or make its exit there, giving the appearance of having passed directly through the chest or abdominal cavity. Wharton and Stillé relate the case of a German student who was wounded in a duel by a pistol ball striking him on the larynx obliquely, and passing around the

neck so as to lodge on the opposite side of the thyroid cartilage. A charge of shot entering the scalp on one side has been known to be deflected between the scalp and the skull, and so travel to the opposite side of the head.

Wounds made with the new Magazine rifle.—Wounds made with bullets discharged from the modern rifle have an entrance-aperture the outline of which is much cleaner than that produced with the old rifle, and the exit-aperture may fairly closely resemble in appearance the entrance-aperture; the soft parts, moreover, are less bruised and the bones less shattered. The altered shape (conico-cylindrical) and the greater velocity of the modern rifle bullet have much to do with this result. The modern rifle bullet is more of a cutting and less of a crushing projectile; and in proportion to the increase in velocity of rifle bullets, so does the sloughing from gunshot wounds diminish.

Several cases of wounds produced with the Lee-Metford magazine rifle at known distances have been recorded.¹ In one instance the rifle was discharged into the mouth, and the exit-wound resembled in appearance the generality of entrance-wounds. In another instance the rifle was fired at a distance of forty to fifty yards, the bullet passing through the upper arm and humerus. The entrance-wound was circular, five-eighths of an inch wide, and the edges were not lacerated; the exit-wound was irregularly rectangular in shape, two inches long by one inch and a quarter wide, and the edges were lacerated and everted. In another case the rifle was discharged at a distance of one hundred and fifty yards, the bullet passing through the shoulder and scapula, and entering at an acute angle. The entrance-wound was elliptical, three-quarters of an inch long by half an inch wide, and the edges were not lacerated; the exit-wound was elliptical, one inch and three-quarters long by one inch wide, and the edges were lacerated and everted. In another instance the rifle was discharged at a distance of two thousand yards, the bullet passing through

¹ *Brit. Med. Jour.*, 1893.

some thin bones of the face. The wounds of entrance and exit were identical in size, shape, and surroundings, except for a slight laceration on one side of the exit-wound. In all these cases the bullets were of a conico-cylindrical shape, and consisted of nickel cases enclosing lead.

Accidental, suicidal, and homicidal gunshot wounds.—In order to determine, as far as may be possible, whether a gunshot wound was accidentally, suicidally, or homicidally inflicted, attention should be especially given to the following particulars:—

I. *Was the weapon directed to a vital organ—the heart or brain?*—An accidental wound may be in any part, whereas a suicidal or homicidal gunshot wound is generally found affecting a vital organ. ✓

II. *Are the characters of the wound such as would have been caused by the discharge of a firearm near the body?*—The wound should be examined to see if the skin around it be discoloured or burnt, or if the clothing be scorched or burnt. If a firearm, loaded with gunpowder, be discharged close to the body, some amount of blackening is almost invariably produced; but exceptional cases have been recorded where no blackening of the wound occurred, although the firearm was held in the hand of the victim. As suicidal death from a bullet wound is not necessarily accompanied by blackening of the skin around the wound, it follows that, in suspected homicide by firearms, absence of blackening around the wound is not incompatible with the weapon having been discharged close to the body, that is, at a distance equal to that from which a man might fire a pistol at himself. As previously stated, if the explosive used be one of the new smokeless powders, there can be no blackening of the wound from smoke or undeflagrated powder, although the flame from the firearm may still produce scorching or burning, if it has been discharged in close proximity to the wounded person. In connection with the Ardlamont case (*Reg. v. Monson*, Edin., 1893), the deceased Hambrough was shot in the head with a charge

of shot, which entered *en balle*. The explosive used was amberite, and there were neither singeing of the hair nor powder marks on the head.

III. *The position of the firearm*.—If the weapon is found tightly grasped in the hand of the dead person, that fact is fairly conclusive of suicide; but blackening of the hand, though sometimes present, is not a necessary result of firing a pistol, and, therefore, it may be absent in cases of suicide by means of such a weapon. In most cases of suicide with a pistol or revolver, the weapon is found lying on the ground near the body. If the revolver be found lying loosely in the hand of the dead person, the case may be one of suicide or homicide, as a murderer may place the weapon in the hand of his victim with the object of making the homicidal act appear to be one of suicide. If a man accidentally shoot himself while examining a firearm, the weapon falls from his hand as, in all probability, it will have been but loosely held at the moment of its accidental discharge.

IV. *The position of the wound*.—If a wound from a firearm be found at the posterior part of the body, it is suspicious of homicide; it is possible, however, for such a wound to be inflicted accidentally, or even suicidally. An accidental wound in the back has been caused by a sportsman dragging a loaded gun after him through a hedge with the muzzle pointing towards him. It is possible for a gun to fall backwards from the grasp of a person carrying it, and to be discharged by the fall and wound the individual in the back. Harvey¹ records a case of suicide of a man who shot himself twice with small cartridge shot from a sporting gun. In the first instance he placed the barrel quite close to his left side, nearly at right angles with his body. The charge penetrated the abdomen, four and a quarter inches below the left nipple and two inches to the inner side, smashing the seventh and eighth ribs. The charge mainly buried itself in the fatty tissues of the neighbourhood. A probe passed through the

¹ *Brit. Med. Jour.*, 1895.

wound, led down about six inches in the direction of the transverse colon and stomach. The skin all around the wound was charred. No immediate fatal effect following, the man proceeded to load the gun with another similar cartridge. This time he placed the muzzle of the gun in his mouth, and is believed to have pushed down the trigger with a long clay pipe. The roof of the mouth was blown away. The malar bone and zygomatic arch were completely shattered, and the left side of the face likewise blown away, making an enormous wound. The brain was completely disorganised, and all the cranial bones on that side smashed into some twelve or fourteen pieces, which were lying more or less loose in the cerebral cavity. Although the terrific force succeeded in producing such terrible destruction, it nevertheless failed to produce any external lesion of the scalp.

V. *The position of the bullet.*—Very little information is to be derived from this. It is incorrect to assume that if a bullet be fired close to the body it must of necessity traverse it. Such is generally true of a rifle bullet if discharged at short range, but it is not the case with many revolvers and pistols. Hence it is wrong to assume when there is only one external wound, and the bullet has lodged in the body, that the firearm must have been discharged from a distance. A bullet may be fired close to a person and yet not traverse the body. When a person commits suicide by firing a revolver into the mouth, or close to the head, the bullet generally remains imbedded in some part of the head.

Wounds from small shot.—If a gun loaded with small shot be fired at the body when only a very few inches from it, the shot do not spread so as to make separate wounds, but one round opening is produced with somewhat irregular and contused edges, and larger than a bullet wound. As the distance of the gun from the body is increased, the single opening is more or less lost, and the surface of the body becomes covered with small wounds made by the different pellets. It is impossible to state with any certainty the respective distances at

which these various effects are produced. For instance, a 'choked' barrel causes the shot to carry compactly for a greater distance than a barrel of the same bore throughout. Moreover, the employment of different explosives will affect the spreading power of the shot.

Wounds from wadding and gunpowder.—A piece of wadding may produce serious or even fatal injury, according to the distance at which the firearm is discharged from the body. From experiments made by Swift on the dead body with a pistol loaded with gunpowder and wadding, he found that at twelve inches distance from the body the clothes were torn and the skin abraded, but the wadding did not penetrate; at six inches the clothes were torn, and the wadding penetrated to the depth of half an inch; at two inches a ragged and blackened wound was produced, two inches deep; at an inch and a half from the chest the wadding passed into the cavity between the ribs, and in a second experiment it carried away a portion of a rib. Taylor and Stevenson¹ mention the following cases of death caused by the discharge of wadding from firearms. A man discharged at another, within a few feet, a gun loaded with powder and paper wadding. Death occurred in a few minutes, and it was found that the chest was penetrated, and that the wadding had wounded the left auricle of the heart. A girl was killed by a boy, who discharged at her a gun loaded with paper pellets. Some of these penetrated the body, and lodged in the lungs and liver. A man discharged at another a gun loaded with powder and wadding at a distance of about eighteen inches. The man instantly fell dead. On inspection, his clothes were found torn, the intestines were lacerated, and the wadding was lodged in the abdomen. In connection with such accidents, much, of course, must depend on the quantity of powder used, and the looseness or compactness of the wadding after being rammed down.

Even gunpowder alone is capable of producing serious

¹ *Med. Jurispr.*, vol. i.

wounds, if fired at close quarters at an exposed part of the body. A wound so produced presents a lacerated appearance, and is blackened and burned. Some of the undeflagrated particles of gunpowder may be driven into the skin, giving to it a peppered appearance.

CICATRISATION OF WOUNDS

The identity of a person, living or dead, and the correctness of a statement made by an accused person, may sometimes be determined by the examination of a cicatrix. Although the time at which a particular wound was inflicted may become an important medico-legal question, yet there are no appearances in a cicatrix by which this can be determined, beyond the rough idea of its duration that can be gained from an observation of the colour of the scar. The questions, in connection with cicatrices, that may be of medico-legal importance are the following:—

I. Does a cicatrix always result from a wound?—The answer to this is yes, although slight punctures or the wounds produced by leech-bites, affecting only the surface of the skin, may leave no trace after a few weeks or months.

II. May cicatrices become so changed by time as to be no longer recognisable?—Permanent cicatrices are left by the healing of wounds that have involved loss of substance of the true skin, by wounds healing by granulation, by the pustules of small-pox, by setons and issues, and probably from vaccination if efficiently performed. Cicatrices increase in size during the process of growth of individuals. The growth of vaccination scars has frequently been noticed. Adams found, in the case of an infant on whom the operation had been efficiently performed, that a cicatrix had doubled in length and greatly increased in width after eighteen years.

III. What colour or colours may a cicatrix possess at different periods?—In an early stage a cicatrix is softer and redder than the surrounding skin; the colour then fades to

brown, and later the cicatrix becomes white, hard, smooth and shining.

IV. **What are the peculiar characters of cicatrices?**—They are of smaller size than the original wound, and are usually depressed. Cicatrices are fibrous in structure, and are destitute of hairs, sweat glands, sebaceous glands, fat, and pigment. A scar upon a negro is white.

CHAPTER XXIX

Burns and scalds—Causes of death from burns—Distinction between burns produced before and after death—Wounds upon the burned—Preternatural combustibility of the human body.

A **burn** is an injury to the body caused by heat brought to bear upon it by contact with heated solid or molten bodies, or by flame or radiant heat. Injuries resulting from corrosive liquids, such as the strong mineral acids and alkalies, are popularly termed burns, and are so designated in the statutes.

A **scald** is an injury produced by a liquid, heated above a certain point, or by steam applied to the surface of the body, or within the mouth or other cavities.

Neither a burn nor a scald appears to be considered as a *wound* in law; in the statute on wounding they are included among bodily injuries dangerous to life.

The intensity of a burn is proportionate to the temperature, area, and duration of action of the causal agent; it varies from a slight redness to a complete charring of the tissues. Metals heated to redness or in a molten state produce very severe burns, especially as in the latter state partial adhesion of the solidified mass occurs to the affected part. Burns and scalds are dangerous in proportion to the severity of the injuries they produce, both as regards the extent of surface of the skin involved, and the depth to which they extend; to some extent the localisation of the lesion affects the danger. The extent of the surface of skin involved in a large superficial burn is likely to be more dangerous than a severe burn of a small part of the

body, provided the locality of the latter is not exceptionally dangerous. If a superficial area equal to about one-third of the entire body-surface be destroyed, death is almost certain to ensue. In other words, the prognosis becomes unfavourable in proportion to the extent of surface involved. The explanation of this is that there is a greater implication of sensory nerves in a burn of large area, and a greater extent of skin is prevented from doing its work of excretion and heat regulation. In connection with prognosis, other circumstances have to be taken into consideration, such as age, constitution, and the character of the burn. Burns are more dangerous in the young and in the cases of weak people; more dangerous on the trunk than on the limbs, and more dangerous if in separate patches than if continuous, provided they are of equal extent.

Extent of burns.—Dupuytren has classified burns according to their degree or extent as follows:—

1. Superficial inflammation of the skin, without vesication.
2. Severe inflammation of the skin, accompanied by vesication; the blisters contain serum, which may be clear, opaque, or bloody. If the cuticle be removed, the true skin is found very red, and later on secretes pus.
3. Destruction of the superficial part of the true skin, forming an *eschar*, which may be hard and brown or black if resulting from a burn with a solid, or soft and yellow if made by a liquid. The surrounding skin is red and blistered. These burns leave cicatrices, which are white and shining.
4. Destruction of the skin as far as the subcutaneous tissue. These burns differ from the last-mentioned in the deeper destruction of the parts, and in the thickness of the sloughs. They leave cicatrices, which are puckered, and depressed below the level of the skin.
5. The destruction involves the entire skin, the subcutaneous cellular tissue and a portion of the muscles. The general character is the same as in the last-mentioned.
6. Complete charring of the burnt part, as when a portion of the body is burnt by fire.

Causes of death from burning.—Death from burning may result from a variety of causes, and may be direct or indirect. The following are the various ways in which death may be caused by burning:—

I. *Suffocation*.—This may result from want of air, or by poisoning from the inhalation of carbon dioxide or carbon monoxide (carbonic oxide). If death occur from carbon dioxide poisoning, the blood is of a dark colour; if from carbonic oxide, it is of a bright red colour.

II. *Shock*.

III. *Stupor*.—This especially occurs in connection with severe burns or scalds inflicted on children. The coma very closely resembles that of opium or other narcotic poisoning.

IV. *Enteritis and ulceration of the bowels*.—The ulceration is especially apt to occur in the duodenum; it is probably due to thrombosis of a vessel supplying a portion of the mucous membrane, and consequent necrosis of the part from the cutting off of the blood supply.

V. *Bronchitis*.—From irritation of the bronchial mucous membrane, set up by the products of combustion or of partial combustion.

VI. *Pneumonia*.—Produced in a similar manner to bronchitis

VII. *Tetanus*.

VIII. *Erysipelas*.

IX. *Gangrene, pyæmia, and exhaustion*.

Recent observations in connection with early death from burns and scalds tend to demonstrate that the fatal event is caused by destruction of, or by interference with, the function of the red blood corpuscles by the heat. Probably the altered red corpuscles cling together, and to the walls of the smaller vessels, and so cause blocking of them by thrombosis. Salvioli¹ believes that the blood-plates, affected by the heat, produce minute thrombi by depositing themselves on the walls of the vessels, and that these minute thrombi, becoming subsequently

¹ *Arch. per le Scienze Mediche*, 1891.

detached, produce a shower of emboli. At all events, the probability is that the cause of early death from burns and scalds is a primary blood disorder, due to injuries inflicted on the red blood corpuscles by the heat.

Post-mortem appearances.—These vary according to the severity of the burns or scalds, and the period of time that elapsed between the receipt of the injury and the occurrence of death. If a burn be caused by radiant heat, it leaves a more or less whitish appearance of the skin. If flame come in actual contact with the skin, the surface is blackened; blisters may be found about the burn. The flame of an explosive gaseous mixture produces scorching and mummification of the skin; coal-mine explosions frequently cause blackening of the skin from coal-dust or small pellets of coal being driven in by the force of the explosion.

Scalds produced by boiling water or steam are accompanied by the formation of blisters, which, however, may be absent at parts where the cuticle has been stripped off. If the scald has been produced by superheated steam, the skin presents a sodden, dirty-white appearance, and blisters may not be present.

After death from burning, the brain and lungs are frequently found considerably shrunk, and the lungs are often of a reddish colour. The heart is generally filled with blood. The mucous membrane of the air-passages is sometimes found injected and covered with froth, and particles of soot may be deposited on it. The kidneys occasionally show signs of nephritis, accompanied by degenerative changes in the epithelium of the glomeruli and convoluted tubes. The mucous membrane of the stomach and intestines is sometimes found reddened, and ulcers of the duodenum are occasionally present, if the patient survived the burn for some time. Although these duodenal ulcers have been frequently seen, yet they are not present in the greater number of cases. The blood is frequently of a bright cherry-red colour, exactly resembling that of blood from a case of carbonic oxide poisoning. In some cases of death from burning, carbonic oxide poisoning is the cause of the fatal event; but even in cases

where death has not been caused by carbonic oxide, the blood may possess a bright cherry-red colour ; under these conditions, the blood gives the ordinary oxyhæmoglobin spectrum, and is readily converted into reduced hæmoglobin by reducing agents. In such cases the bright red colour is attributed by Falk¹ to the reflection of light from microscopic coagula produced from some of the albumin of the blood, the light in consequence only penetrating a superficial layer of the blood, and therefore less of the light being absorbed. According to this explanation, the bright red colour of the blood is not due to any chemical change in its colouring matter, but purely to a physical cause. Bright red blood, the colour of which is due to this physical cause, may be found not only in the bodies of those who have died from burning, but also in bodies which have been exposed to a sufficiently high temperature after death. If, however, the bright red colour of the blood be found to be due to the presence of carbonic oxide hæmoglobin, that is a sure indication of the gas having been inhaled, and therefore of the person, in whose blood it is found, having been alive during the progress of the fire.

Distinction of burns produced before and after death.—The important medico-legal question may be raised as to whether the burns on a dead body were produced before or after death. A murderer might, after killing his victim, set fire to the apartment or house, in the hope of escaping detection. If a body be found completely charred, it is impossible to determine whether it was living or dead when first acted upon by the heat ; if, however, the burns are less extensive, it may be possible to form an opinion. Such an opinion is mainly based upon the nature of the vesication, and the characters of the contents of blisters that may be found on the body. It was formerly believed that the production of blisters containing fluid only occurred in connection with vesication produced during life ; and that blisters produced from a burn after death contained either gases

¹ *Vierteljahrsschr. f. ger. Med.*, 1888.

or aqueous vapour, in the latter case being in a shrivelled condition from condensation of the aqueous vapour after withdrawal of the heat. This opinion, however, is now known to be incorrect. It was first discovered that blisters, containing fluid, could be produced on dead bodies affected with general dropsy; and later, it was found that, under suitable conditions, blisters containing fluid may be produced on any dead body. The most important condition is that death should not have occurred too long before their production. Bonchut found that, by the application of heat, he could produce vesicles containing a watery serum within twenty-four hours after death. If the body be quite cold and rigid, blisters containing gases or aqueous vapour are alone produced. If, however, blisters containing fluid are produced after death, there is a marked difference in the composition of the serum as compared with that contained in blisters produced on the living. In the latter case the serum is rich in albumin, and when coagulated by boiling, or by the addition of strong nitric acid, it sets almost to a solid; in the case of blisters produced on the dead, the serum is almost entirely devoid of albumin, and is only rendered slightly milky by boiling, or by the addition of nitric acid.

Another important method for distinguishing between burns produced before and after death is to look for the presence or absence of marks of inflammatory changes at the circumference of and at the base of each blister. In the case of burns produced on the living there is a deep red line around the burn, and the skin at the base of the blister (after removal of the cuticle) presents a dotted redness, the dots corresponding to the sweat-glands and hair-follicles. In the case of burns produced on the dead, there is no red line around the burn, and the base of the blister is dead-white, unless the burns have been inflicted almost immediately after death. In connection with the redness of the base of a blister, it should be borne in mind that, on the one hand, the redness of the base not uncommonly disappears after death, and, on the other, that a slight reddening

ing of the base of a blister occasioned after death may result from exposure to air.

To sum up the distinctions between burns inflicted before and after death :—

I. If the fluid in the blister be rich in albumin, the inference is that the burn was inflicted during life ; if containing little or no albumin, that it was produced after death.

II. If the blister be surrounded by a bright red line, the inference is that it was either produced during life or immediately after death, during the molecular life of the part or tissue concerned.

III. If the blood contain a quantity of carbonic oxide, as indicated by spectroscopic examination, the inference is that the individual from whose body the blood was taken was living at the time of first exposure to the burning.

IV. If particles of soot are found in the larynx, trachea, or bronchi, the inference is that respiration occurred after exposure to the fire.

Wounds upon the burned.—If wounds are found upon the body of a person supposed to have been burnt to death, it may be a matter of great importance to decide whether the wounds were inflicted before the burning, or whether they were the result of the burning. Injuries are sometimes produced upon the body by extreme heat, which may closely resemble incised wounds ; these injuries are mechanical results of the heat, and consist of fissures in the thorax, or abdomen, or in the neighbourhood of large joints, especially at the flexures. These fissures are generally irregular in form and have uneven edges ; as the blood-vessels, by virtue of their elasticity, are apt to escape being torn, they may be seen stretching across the fissure. Such a disposal of the blood-vessels is a sure indication of the fissure having been caused by heat, and not by the use of a weapon. Another characteristic that may be found, in connection with these heat-wounds, is that where the skin has fissured the melted fat has run out of the wound and formed a varnish-like deposit around the fissure. As a rule these heat-

wounds are of no great depth, but cases have been recorded in which they have been sufficiently deep to expose the contents of the thoracic and abdominal cavities. Cases have been recorded in which strangulation marks have been visible on bodies that have been almost charred by burning. No doubt the preservation of such a mark is due to the cord, or other constricting medium, having been left round the neck, and so acting as a protective agent to the skin beneath. In cases of wounds found on partially burned bodies, the possibility of their being due to pieces of timber &c. accidentally falling on the person or body must not be overlooked.

PRETERNATURAL COMBUSTIBILITY OF THE HUMAN BODY (SO-CALLED SPONTANEOUS COMBUSTION)

The term 'spontaneous combustion' has been applied to two conditions—spontaneous ignitability, and preternatural or increased combustibility. With regard to spontaneous ignitability of the human body, there is no evidence whatever to justify the use of such a term; so that all cases of so-called 'spontaneous combustion' resolve themselves into cases of increased or excessive combustibility of the human body, it being always understood that burning matter of some kind is necessary to the firing of the human body even when in such a condition of hypercombustibility.

The subjects of this unusual condition are generally of very intemperate habits and possess flabby, bloated bodies; exceptional cases have occurred among individuals of temperate habits and spare persons. Generally the catastrophe occurs when the person is in a drunken condition, and always when in close proximity to fire or flame of some sort. The association of this condition with alcoholism led to the supposition that the presence of the alcohol in the tissues was the cause of the increased combustibility of the body, but this is not the case. The soaking of dead bodies in alcohol, and the injection of alcohol into the veins of living animals, do not increase the

combustibility of the tissues. The preternatural combustibility is due to the formation within the body of some substance or substances capable of burning when once ignited. Dupuytren has advanced the explanation that increased combustibility of the human body is due to excess of fat. Certainly a review of the cases demonstrates that the charring was always most extensive in the skin and subcutaneous adipose tissue, and in other places where fat is abundant, and least marked in organs and regions with less fat. The fatty degeneration of the various organs and structures would form a body of oleaginous matter which, when once ignited, would tend to burn *in situ* rather than to flow out, and so would account for the fact, which is well known in these cases, of the greater destruction of the corpse than of objects in the vicinity. According to this view, the influence of alcoholic indulgence is to increase the deposition of fat in the body generally, and to act as a stupefying agent, so rendering the occurrence of an accident with fire more liable.

Hava¹ has recently published the results of some experiments on the subject, from which he draws the novel conclusion that preternatural combustibility in man is possibly the result of gradual and progressive accumulation for years of carbonic oxide in the tissues; contact with a flame or fire being, of course, indispensable for the starting of the combustion. According to his views, the gradual accumulation of carbonic oxide in the tissues expels the oxygen, so that oxidation is slowed, the formation of fat is favoured, and the reason why the victims complain of feeling cold in all seasons is explained. He believes that the victims of preternatural combustibility are those who inhabit badly ventilated rooms heated by stoves, and who employ charcoal foot-warmers, and so are exposed for years to atmospheres containing minute quantities of carbonic oxide. He asserts that the luminous flame which has been seen from bodies undergoing this peculiar form of combustion is the flame of burning carbonic oxide. His explanation of so-

¹ *New Orleans Med. and Surg. Jour.*, 1894.

called spontaneous combustion is that the victim, in an unconscious state or when dead, comes in contact with a flame or fire, and that the carbonic oxide begins to burn, producing an intense heat, which carbonises a small patch of skin, subcutaneous and muscular tissues. The carbonised tissue, being very light and porous, absorbs the first drop of melted fat, which then burns with a characteristic smoke. From this moment, and as long as there is fat to be melted by the intense heat of combustion, the body continues to burn of its own accord. In confirmation of these views Hava states that he kept rabbits and roosters for months in an atmosphere impregnated from time to time each day or continuously with some carbonic oxide, and that in this way their tissues acquired increased combustibility. The shortest time in which he succeeded in accumulating in a rabbit's tissues sufficient carbonic oxide to produce increased combustibility was 169 days of continued administration. The skin, subcutaneous and muscular tissues were readily combustible, burning with a bluish flame, and leaving very porous carbonised masses retaining the shape of the parts that had been consumed. A rooster, whose flesh was rendered combustible by inhalation of an atmosphere containing some carbonic oxide, was kept in the contaminated atmosphere for over eight months.

Booth¹ records a case of so-called 'spontaneous combustion,' which may be taken as a fairly typical case of preternatural combustibility of the human body. The victim, a man aged sixty-five, was a pensioner of notoriously intemperate habits. He was seen at nine o'clock one night to enter a stable, in the loft of which he was in the habit of sleeping, and was heard to ascend a ladder leading to a loft above; afterwards the skylight of the loft was seen lighted, and later still the light appeared to be put out. Between 8 and 9 o'clock next morning smoke was observed issuing from a hole in the roof of the loft, and when the stable below was entered, the remains of the old soldier were seen through a hole in the loft floor, perched on

¹ *Brit. Med. Jour.*, 1838.

the joists above, and leaning against the wall. On examining the remains, Booth found that they were completely charred, and kept only by one of the joists and the burnt remnant of the flooring under him from falling through into the stable beneath. Notwithstanding the presence of abundant combustible material around, such as hay and wood, the main effects of combustion were limited to the corpse, and only a small piece of the adjacent flooring and the woodwork immediately above the man's head had suffered. A small piece of the flooring immediately round him had fallen through into the stable below, leaving the hole through which he had been first seen. The body was almost a cinder, yet retained the form of the face and figure so well, that those who had known him in life could readily recognise him. Both hands and the right foot had been burnt off, and the charred and calcined ends of the right radius and ulna, the left humerus, and the right tibia and fibula were exposed to view. The hair and scalp were burnt off the forehead, exposing the bare and calcined skull. The tissues of the face were represented by a greasy cinder retaining the cast of the features, and the incinerated moustache still gave the wonted military expression to the old soldier. The soft tissues were almost entirely consumed, more especially on the posterior surface of the body, where the clothes were destroyed, and the posterior surfaces of the femora, innominate bones, and ribs exposed to view. This was probably due to some slates having fallen from the roof on the body, as otherwise a more perfect cinder might have been found. When an attempt was made to remove the body it collapsed *en masse*. From the comfortably recumbent attitude of the body it was evident that there had been no death struggle, and that, obfuscated by the whisky within and the smoke without, the man had expired without suffering, the body burning away quietly all the time,

LIGHTNING—HEAT—COLD—STARVATION

CHAPTER XXX

Injuries and death from lightning and electricity—Appearances of death from lightning—Death from heat—Death from cold—Death from starvation.

INJURIES AND DEATH FROM LIGHTNING AND ELECTRICITY

INJURIES and death caused by lightning may be of medico-legal importance when a medical man is called upon to determine the cause of death in a case where a body has been discovered in a remote or solitary situation, with marks of severe external injury on it, or perhaps partly or entirely stripped of its clothes—conditions which might very probably lead, at first, to a suspicion of foul play.

During a thunderstorm, the electric condition or polarity of the thunder-cloud is usually *positive*, while that of the earth immediately beneath it is *negative*. When these polarities become intensified by mutual induction, an electrical discharge takes place through the intervening air, or through any other medium, such as the human body, that happens to be present in the path of the discharge. Persons taking shelter, during a thunderstorm, under trees, and especially under a solitary tree, and persons in the open country, are much more liable to be struck by lightning than those within doors.

The traumatic influence of a lightning flash is not by any means limited to its apparent path. It is true that in the track of its apparent path its power of inflicting damages is at a

maximum, but on either side of this track is an area within which the traumatic effects of the current may be experienced. Hence proximity to a tree that is struck during a thunderstorm is dangerous.

Death from lightning may occur without any traces of injury, but, as a rule, burns are inflicted on the body, and frequently traumatic effects are produced which may closely resemble those resulting from the employment of great mechanical violence. Contusions, lacerations, fractures of bones, and tearing of the clothes and boots, may all result from being struck by lightning; so that persons, unacquainted with the possibility of such effects of lightning, might readily be suspicious that the deceased had met with foul play, and had probably been murdered. As an instance of the extreme violence that may be wrought, especially on the clothes, by lightning, Wilks¹ relates the case of a man who was struck while standing under a tree, which was also struck. When found, shortly afterwards, he was lying on his back about six feet away from the tree, and although completely clothed before being struck, he was stark naked, his clothes being scattered in a line for several yards along the field, whilst his boots were at the foot of the tree. The man did not lose consciousness, and stated that he felt himself violently struck across the chest and shoulders, hurled through the air, and dashed upon the ground. He was more or less burnt all over; the right os calcis was fractured, and there was a compound comminuted fracture of the right tibia and fibula. He showed no signs of shock, and eventually recovered. Knaggs² relates the case of a man who was struck by an upward discharge while at work in a field; the discharge passed through his body, and almost completely tore off the right ear, while the hair on the same side of the head appeared to have been shaved off for a space of about six inches by two inches. A large hæmatoma was found over the right parietal region, and beneath there was an extensive fracture of the skull, extending from the left

¹ *Med. Times and Gaz.*, 1879.

² *Brit. Med. Jour.*, 1894.

side across the middle line to the right, and thence to the base, where it involved the middle fossa, as well as the orbital plate of the frontal and the cribriform plate of the ethmoid bones. Taylor and Stevenson relate the three following cases, which well illustrate the comparative effects produced by a slight shock, a severe shock, and a fatal shock. Three persons were struck by lightning, and were seen by a medical man about twenty minutes later. One, a boy aged ten years, was then able to walk, although unable to move his legs immediately after the occurrence. His hair and clothes were not singed, and the metallic buttons on his dress showed no signs of fusion. On removing his clothes a slight odour of singeing was perceptible. He complained of pain in the lower part of the abdomen. There were several red streaks, of about a finger's breadth, running obliquely downwards and inwards on either side of the chest to the middle line in front of the abdomen; they then descended over the pubes, and were lost in the perineum. This boy made a complete recovery; the red streaks disappeared gradually, and could hardly be traced four days after the injury. Another boy, aged eleven years, lay prostrate and unconscious, with an expression of terror and suffering. He foamed at the mouth, moaned piteously, and flung his legs and arms about in all directions. The breathing was deep, slow, and laborious; the heart palpitating, the pulse weak and very irregular; the pupils dilated and insensible to light. There were in this case several red streaks, converging from the neck and shoulders to the middle of the sternum, and passing over the abdomen, and there were similar streaks over each hip. The boy was in a sitting position when struck. The hair on the back of his head and neck was singed, and the peculiar odour of singeing was noticed, but his clothes were not burnt, and the metallic buttons on his dress showed no signs of fusion. He became conscious in five hours, and rapidly recovered; the red streaks gradually disappeared. The third case was that of a man, aged forty-six years, who, like the two others, was in a sitting posture when struck, and appeared

to have been killed on the spot, without having moved hand or foot. The countenance was placid, and the pupils were widely dilated. There was a large lacerated wound of the scalp, at the junction of the occipital with the parietal bones, but without any fracture. The electric current appeared to have passed down each side of the head, between the soft parts and the cranium. On the left side of the neck it had ruptured blood-vessels and muscles, causing swelling of the parts with effusion of blood. On the right side of the neck it had caused lividity and swelling, and terminated just above the clavicle in a dark blue mangled patch of skin, in which there were several free communications with the surface. The hair on the back of the head was slightly singed, and that in front of the chest was singed close to the skin; but the hair around the scalp wound, where the current had entered, was uninjured. The clothes were neither torn nor burnt, and the metallic buttons were not fused. The clothes of all three were very wet. Pope¹ relates five cases of lightning-stroke occurring simultaneously, one of which ended fatally. Several men were congregated under some small trees, watching a cricket-match, when an unexpected flash of lightning, with simultaneous thunder, occurred. Five men were standing under one particular tree which was struck, and a piece of its bark about three feet from the ground was detached; all these men were struck. They were carried away from under the tree, and were examined at once. No. 1 was found to be dead, although artificial respiration was persisted in for some minutes. The face was florid; the eyes were open, pupils dilated, and the conjunctivæ congested. All the muscles were flaccid. There were no marks of injury to the head or face. This man had been sitting on the ground with his back to the tree, just below the piece of bark that had been detached. No. 2 was unconscious, and had ceased to breathe, but the pulse was still perceptible. After some minutes of artificial respiration consciousness gradually returned. There were marks of burning on the left side of the face, neck, and

¹ *The Lancet*, 1890.

upper part of the left side of the chest ; the marks appeared to branch off from the point of greatest injury on the neck and shoulders, forming arborescent lines. The hair on the left side of the head was burnt and singed. The conjunctivæ were congested. As vitality returned the patient complained of severe pain in the legs, which was also experienced by the other three who recovered. There was no paralysis of the legs. Nos. 3, 4, and 5 were all unconscious, but recovered consciousness within a few minutes of being struck. None of them remembered being struck, and they felt nothing until they returned to consciousness. No. 3 complained of severe pain in his head, his left arm and both legs, especially in the legs ; the pains were severe and continuous, and were felt down the backs of the thighs and legs. There was no paralysis of the lower limbs. No. 4 complained of pain in the left arm and leg, similar to No. 3, but had no pain in the head. No. 5 complained of pain in both thighs and legs, especially at the back, but had no pain in the head. No. 2 vomited, but the others did not. The survivors all stated that they felt quite warm, and did not feel cold at any time.

After slight shocks the principal symptoms are headache, confusion of intellect, and pains in the limbs, all of which soon disappear. After more severe shocks, various sensory and motor nerve symptoms may be produced, sometimes accompanied by derangement of one or more of the special senses. Cases have been recorded of paralysis of the arm muscles, the ocular muscles, and the pharyngeal muscles, following severe lightning shock ; of paraplegia, with paralysis of the bladder, from disturbance of the functions of the spinal cord ; and of psychical disturbances. Complete recovery has taken place in the majority of such cases.

Wounds and other injuries produced by lightning.—These effects are remarkably varied. Contusions, fractures of bones, and lacerated or other wounds of different degrees of severity may be produced. Sometimes a deep lacerated or punctured wound will indicate the spot where the current entered the

body, or the hair may be singed or burnt off at that and other places. Burns, superficial or deep, sometimes of a severe kind, may indicate the course of the electric current from the point of entrance, down and around the body, to the ground. These burns are not necessarily the result of ignition of the clothes, but may be due to the direct agency of the electric current; they are especially noticeable under metallic substances that have been intensely heated or fused by the current. The clothing may be torn or even completely stripped off (see p. 87), and the boots may be split open, the upper part being sometimes wrenched off the sole, and the latter split in one or more directions. The clothing may be singed or burnt, and metallic substances, such as buttons, chains, coins, a watch, &c., may show signs of fusion, on account of the metals being such good conductors of the electric current. The violence produced by a lightning shock is most variable and capricious in its effects. Sometimes the clothing is quite unaffected, while severe injuries are inflicted on the body; at other times the clothing may be torn in different directions or completely stripped off the body, while the latter shows no injury whatever. The same lightning discharge may produce lacerated wounds in one person, and burns in another.

The distinction of injuries caused by lightning from those resulting from homicidal violence must be made by noting all the circumstances of the case, and by a careful examination of the body and clothing. The occurrence or not of a thunder-storm about the time of death should be ascertained; the co-existence of burns and wounds on the body, and their peculiar appearance, should be noted; the uncommon nature of rents of the clothing, especially of the boots, and the fusion or partial fusion of metallic articles, such as buttons, chains, and coins, on the person of the deceased, may be of great use in throwing light on the cause of death.

Cause of death from lightning.—The fatal effects of lightning are usually instantaneous, death being due to shock to the nervous system. Exceptionally it may produce some lesion,

generally nervous or vascular, which may ultimately prove the cause of death. If recovery take place, it is generally accompanied by the usual symptoms of concussion.

If a person be outside the track of the main electric discharge at the time of being fatally struck, there may be no sign of injury either to the clothing or to the surface of the body, and occasionally there may be no lesions visible internally. On the other hand, with no signs of external injury there may co-exist serious internal injury to the brain. Hennesy¹ records the case of a man who was killed by lightning without any signs of burning or injury to the body or clothing, but within the skull about half a pint of blood was found extravasated below the dura mater.



FIG. 30.—ARBORESCENT MARKINGS ON THE ARM, PRODUCED BY LIGHTNING

Post-mortem appearances of death from lightning. *External.*—As previously mentioned, wounds of various characters—contused, lacerated and punctured—burns, vesications and ecchymoses may be produced by lightning. In particular, the spot where the electric current has entered or passed out is apt to show signs of contusion and laceration. The ecchymoses may be of considerable extent. Arborescent markings (fig. 30) on the surface of

the body are not unfrequently met with. These markings are not determined, as was previously supposed, by the course of capillary vessels, but are due to a localised erythema pro-

¹ *Brit. Med. Jour.*, 1889.

duced by repeated forkings of the electrical discharge; they therefore indicate the path taken by the discharge. Hair in different parts of the body may be found singed or burnt. Rigor mortis is not absent, as was at one time believed to be the case; occasionally it comes on immediately after death, and in such cases it generally passes away quickly; not unfrequently, however, it occurs at the usual period. The pupils may be dilated, contracted, or unequal. As previously mentioned, careful attention should be given to burns, rents, and tears of the clothing, and to fusion of any metallic substances about the clothing.

Internal.—No characteristic signs are present internally. The blood has frequently been described as dark and fluid; it may, however, coagulate as usual after death. Putrefactive changes generally occur early. Hyperæmia of the membranes and vessels of the brain is sometimes found; effusion of blood on to the surface of or into the substance of the brain occasionally occurs; on rare occasions, complete disorganisation of the brain substance has been observed. The viscera generally are found in a more or less congested state.

Injuries from electricity used for illuminating and other purposes.—The employment of the electric current for purposes of illumination, and as a motor force, has been responsible for many accidents and several fatal results, arising from the accidental contact of individuals with the circuit wires. These deaths have sometimes been accompanied by burning of the bodies at the points of contact of the wires. One case of suicide by means of electricity has been reported, in which a man deliberately took hold of the conductors of a dynamo-machine, and was instantaneously killed. Clowes¹ relates a case of death from electricity in which a workman, employed in connecting a house with the electric main, accidentally received a rapidly alternating current (10,000 alternations per minute) of a strength of about 2,000 volts. His left hand, by

¹ *The Lancet*, 1892.

accident, came in contact with the connecting wire, and a fellow-workman, seeing him fall down unconscious, as if in a fit, immediately broke the circuit by severing the wire by a blow with an axe handle. The man was seen by Clowes about five minutes after the occurrence. The heart and respiration had then stopped. The face, neck, and upper extremities were congested, the eyes suffused, and the pupils widely dilated. The features were not distorted, and the face wore a peaceful expression. There was a strong smell of burning, not unlike the smell of gas. The palm and first two fingers of the left hand were burnt and charred, and the fingers were strongly flexed. The clothing was not burnt or injured in any way. Artificial respiration was maintained for over an hour, strychnine injected, and the faradic current applied to the precordia without result. A post-mortem examination was made three days and sixteen hours after death. Rigor mortis, which had set in shortly after death, and had been strongly marked, was still present to a slight extent in the lower extremities. Decomposition was not advanced in any unusual degree (the time of year was November). The whole of the palmar surface of the forefinger and middle finger of the left hand was burnt, and the tissues of the carpal half of these two fingers were destroyed and carbonised, exposing the flexor tendons. The epidermis generally of the palm of the hand, the palmar surface of the thumb, and of the cleft between the thumb and index finger was burnt black, and was separated from the deeper structures of the skin. On the dorsal surface of the hand, between the thumb and index finger, the epidermis was destroyed and missing over a surface the size of a florin. The vessels of the scalp, meninges of the brain, and brain substance were congested and full of liquid blood, and the surface of the white substance when cut across presented a punctate appearance. The lateral sinuses were full of liquid blood, and the lateral ventricles contained a fair amount of cerebro-spinal fluid. The brain and cerebellum appeared quite healthy. The heart was normal in size and consistence; although not contracted, its cavities

were completely empty. Nankivell¹ reports a case of an electric light linesman, who, while handling a wire carrying a high potential current, received through his body the full pressure of 2,400 volts, the force of which expended itself chiefly on his left hand, which held the wire. The wire was near the roof of a cellar in which the man was working; on receiving the shock the man was rendered insensible, and his legs were drawn up from the ground, so that his full weight came on to the wire, which then broke, and so released him. When seen shortly afterwards he was quite conscious. His left thumb and forefinger were completely black and charred. The eschar extended on the dorsum of the hand to the end of the ulna. On the palmar surface the burn reached to the ball of the thumb and to the metacarpal joint of the forefinger. All these parts were actually burnt to the bones, and were quite insensible to touch. He complained of intense pain in the wrist and parts of the hand which had escaped the effects of the shock. Four toes of the left foot were burnt on the plantar surface, each eschar being about the size of a threepenny piece. After amputation of the affected thumb and forefinger the patient recovered.

Sheild and Delépine² relate the case of a man, aged twenty-one, who was killed by accidentally touching a dynamo-machine. Great cutaneous congestion was present, limited to the head, neck, upper part of the chest, and arms. On the outer aspect of the left index finger was a small elongated blister about half an inch in length by one-eighth of an inch wide. The microscopical examination of the skin of this area showed appearances which in several particulars were different from those seen in connection with ordinary burns or blisters.

DEATH FROM HEAT

Death may occur from *sunstroke*, when the fatal result is due to the direct action of the sun's rays. Heat-stroke may

¹ *Brit. Med. Jour.*, 1892.

² *Ibid.*, 1885.

also be produced by exposure to long-continued artificial heat, as in engine-rooms, factories, &c., where a very high temperature is being maintained. Heat-stroke is probably occasioned by a very high and continued temperature, which causes a derangement of the heat-regulating centres; this is probably facilitated if the surrounding circumstances are such as to depress the resisting powers of the individual. Intense heat generally operates by producing congestion of the brain (so-called 'heat-apoplexy').

Symptoms.—These vary according to the condition produced by the excessive heat. The nervous symptoms may consist of headache, vertigo, drowsiness, insensibility, coma, and paralysis; hyperpyrexia occasionally occurs, and may be accompanied by wild delirium. The pulse is soft and feeble, the respiration shallow, and the heart slowed. Nausea or vomiting may occur.

Post-mortem appearances.—These are not constant. As a rule rigor mortis sets in early and disappears speedily; putrefactive changes advance quickly. The viscera are generally in a hyperæmic or congested condition. Destruction of the red blood corpuscles has been observed.

DEATH FROM COLD

Cold exerts a depressing effect upon the animal body; if, however, the exposure be of short duration, and the system be healthy, reaction takes place and stimulation follows. Death from cold is hastened by any conditions that tend to exhaustion of the nervous system, such as fatigue, both bodily and mental, loss of rest, want of proper food, disease, and especially intoxication. Infants, and new-born infants especially, readily perish from exposure to cold.

Symptoms of exposure to cold.—There is loss of physical and mental energy. Sensibility is generally soon lost, a state of torpor being followed by profound sleep; then follows a gradual cessation of the vital functions. Occasionally disturbances of

the nervous system occur, as indicated by psychical derangement. These various symptoms are, in the main, explained by the fact that a very low temperature interferes with the capacity of hæmoglobin to give up its oxygen, so that a gradual depression of the functional activity of the nervous system and of the various organs of the body takes place.

Post-mortem appearances.—These are not very characteristic, so that caution is necessary in forming an opinion as to whether exposure to cold was the primary cause of death.

External.—Rigor mortis usually sets in slowly, and persists for a long time. The pallor of the surface of the body contrasts with the colour of the post-mortem stains, which are of a cherry-red hue on those parts of the surface of the body exposed to the air; the colour of these stains closely resembles that of the stains met with in cases of poisoning by carbonic oxide. This colour of the post-mortem stains is, however, no proof of death from cold; after death from other causes a similar appearance may be produced by subsequent exposure of the body to cold. Falk¹ gives the following explanation of the manner in which these cherry-red stains are probably produced:—At very low temperatures hæmoglobin loses its power of parting with oxygen, but not its power of uniting with it; this applies to the blood of the living and the dead. If, therefore, a body be exposed to a very low temperature, the blood contained in the superficial vessels of the parts exposed to the air is capable of obtaining oxygen by diffusion through the skin, and uniting with it forms the bright red compound of oxyhæmoglobin; in consequence of the lowness of the temperature, this does not part with its oxygen, so that the bright red colour remains. If, however, such a body be exposed to a higher temperature, then, as the temperature rises, the oxygen is capable of being abstracted from the oxyhæmoglobin by the surrounding tissues, so that the stains then become dark and resemble ordinary post-mortem stains. If putrefaction has commenced previous to the exposure of the body to cold, these cherry-red stains do

¹ *Vierteljahrsschr. f. ger. Med.*, 1887 u. 1880.

not appear, as the decomposing tissues are active deoxidisers, and prevent the union of any oxygen, that may diffuse through the skin, with the hæmoglobin of the blood. No putrefactive changes will be present if death has occurred from exposure to cold, and if, after death, the body has remained at or below the freezing point. If a frozen body be found with signs of putrefaction present, the assumption is that death was not caused by cold, although there is just the possibility that death may have been caused by cold, and that a subsequent rise of temperature caused putrefaction to commence, an after-renewal of cold causing the freezing of the putrefied body.

Internal.—There is generally an accumulation of blood on both sides of the heart; the blood is sometimes bright red, sometimes dark in colour. The brain and its membranes are generally congested, and a similar condition is occasionally found in the abdominal viscera.

DEATH FROM STARVATION

Starvation may be acute or chronic. **Acute starvation** implies the sudden and total deprivation of food. **Chronic starvation** is the result of a continued deficient supply of food, both as regards quantity and quality. Chronic starvation may be the result of disease, as, for instance, in connection with stricture of the œsophagus, carcinoma of the stomach, gastric ulcer, malignant and tubercular affections of the intestines, disease of the pancreas, &c. It may also be due to defective nutrition, as may occur in districts where famine is prevailing, or from insufficient and improper food, which may cause accidental starvation of infants, owing to ignorance on the part of mothers or nurses, or wilful starvation, as is frequently witnessed in the victims of *baby-farming*.

Symptoms.—After some hours the sense of hunger is not very urgent; there may be some pain or discomfort felt in the stomach, but it is not associated with a desire for food, as the natural sensation of hunger generally disappears after thirty-

six or forty-eight hours of fasting. Great thirst is felt, and progressive and extreme emaciation follows. The skin is pale, harsh, dry, and wrinkled, and hangs loosely over prominent bones; dirty-brownish stains exhaling a peculiarly offensive putrescent odour, which, however, is unlike that of ordinary putrefaction, appear on the skin, where purpuric spots have also been observed. The eyes and features become sunken, the malar bones standing out prominently. The abdominal wall falls in, and the bodies of the vertebræ can be easily felt through it. Progressive muscular weakness occurs. The temperature is usually subnormal, and the pulse is feeble. As a rule, the bowels are very costive, or they may cease to act altogether. If they act, the fæces are usually hard scybalous lumps, which cause much pain in passing. The state of the urine depends on whether liquid be taken or not, and the amount of liquid taken. If no liquid be taken, there is a progressive diminution in the daily amount of urine, and the colour and specific gravity are higher than normal. Several observations have been made as to the daily excretion of urea when food is abstained from, but water is taken. Luciani¹ examined the urine of Succi previous to and during one of his fasts, and found that on the last day of taking food the nitrogen in the urine amounted to 16·29 grammes. During the first twelve days of fasting it sank from 13·8 grammes to 7·29 grammes, and then progressively diminished to 3·2 grammes on the twenty-second day of the fast.

The intellect may be clouded or may remain clear, but despondency and hallucinations are not uncommon towards the end. Delirium is not a common symptom, and chiefly occurs among shipwrecked sailors exposed to the heat of a tropical sun, and is probably hastened by their drinking salt water, or their own urine. Taylor and Stevenson relate the case of a healthy man, aged sixty-five, who, by an accident, was shut up in a coal-mine for twenty-three days without food, but who was able to somewhat allay his severe thirst by drinking

¹ *Fisiologia del digiuno*, 1889.

some foul water. When found, he was conscious, and he recognised and named his deliverers. He was so weak that he could scarcely raise his hand to his mouth, and he was extremely emaciated. Under careful treatment he recovered sufficiently to give an account of his feelings, but died on the third day after his rescue.

Period of death.—The interval between the deprivation of food and the occurrence of death is dependent upon several circumstances, such as age, condition of health, temperature, and access or not to drinking-water. Age has a very considerable influence; young children quickly die from starvation, whereas adults and old people can linger for a long time. The stronger in health an individual is, and the better the nutrition of the body, the greater is the power of endurance. The warmer the temperature, within moderate limits, the better is the conservation of body-heat, and therefore the longer a person can live without food. Drinking water necessarily tends to prolong life considerably. In 1890 an Italian named Succi underwent a voluntary fast of forty days; during this period he had free access to water, and also took small quantities of some anodyne or narcotic; at the time, apparently, the fast did not produce any permanently injurious effects. In the absence of food, but with access to water, a man is stated to have lived sixty-four days.

Casper regards a period of from twelve to fourteen days as the limit for the survival of a strong, healthy man, if entirely deprived of food and drink. This limit is probably fairly correct, although it is stated that life has been prolonged for twenty days, without food or water. Taylor and Stevenson relate an instance of entire privation of food for eleven days, which occurred in 1878. A young man, aged twenty, stowed himself away in the hold of a steamer sailing from Liverpool to New York; on the removal of the hatches when the ship arrived at New York, he was found insensible in the hold. During the entire passage he had had neither food nor drink. He found some salt below, of which he ate about two handfuls.

He had with him an empty glass flask, from which he drank his urine each time that he voided it. He suffered from hunger only on the second day; after that he had intense thirst for four days. He then became insensible, and remembered nothing until he woke up in New York. The muscles of his extremities did not appear to be much wasted, but his cheeks and abdomen were greatly retracted, and presented a livid appearance. After a few days he completely recovered.

Post-mortem appearances.—I. After death from starvation the body is usually **emaciated**, and there is a general **absence of fat**. Death, however, may result from acute starvation, and yet there may be very little emaciation. This occurred in the case of the so-called Welsh fasting girl, an imposture in connection with which it was affirmed that she had taken no food for over two years. All this time she had continued plump. A careful watch was instituted, and she died on the eighth day of the watch. At the post-mortem examination the body was found plump and well formed; beneath the skin of the chest and abdomen was a layer of fat about three-fourths of an inch in thickness.

II. The **eyes** and **cheeks** are generally sunken; the **skin** is dry and harsh, and frequently coated with dirty-looking stains.

III. The **omentum** is shrunk, and destitute of fat in most cases, and the **stomach** is contracted, thin, and transparent. It may contain a little bile-stained fluid; the mucous membrane is usually corrugated and pale, but may be faintly reddened.

IV. The walls of the **intestines** are in a peculiarly thin and translucent state, owing to atrophy; this especially occurs in the small intestine, the walls of which sometimes become so transparent as to render substances within them easily visible. In addition, the small intestine is contracted, and may either be empty or contain a small quantity of bile. The large intestine may contain a small quantity of hard faecal matter, and the rectum may be hyperæmic.

V. The **liver** is diminished in size, while the **gall-bladder** is usually distended with bile. The **pancreas** is generally considerably atrophied.

The signs most indicative of death from starvation are the absence of fat, the signs of general wasting, and the peculiar atrophied and translucent condition of the intestinal walls. The order in which the various parts of the body waste are—first, the fat; then, the glandular organs; and, lastly, the skeletal muscles.

Homicidal starvation.—With the exception of infants starved to death by baby-farmers, starvation is very rarely the cause of homicidal death. It should be borne in mind that the law does not require proof of the entire deprivation of food; it is sufficient if proof be forthcoming that the necessary quantity and quality have been withheld, *provided this has been done with an evil intention.*

In connection with many cases of death from starvation, some diseased condition (apart from mere atrophy) is found, which may have been induced or aggravated by the starvation, or which may have pre-existed. If the case be one of supposed homicidal starvation, the defence generally is that death was either due to the disease, or that the starvation was a consequence of the disease from inability to digest or assimilate food.

The case of *Reg. v. Staunton and others* (C.C.C., September 1877) affords a good illustration of the care that is required on the part of medical witnesses in forming an opinion as to the cause of death in an alleged case of starvation. Staunton, his brother, and the brother's wife, and a girl named Alice Rhodes, were put on their trial for causing the death of Harriet Staunton, the wife of the first-named prisoner, by starvation and neglect. The prisoner Staunton, the husband of the deceased, had formed an illicit connection with Alice Rhodes. The deceased had been kept in close confinement for some time, and, when in a most exhausted and debilitated condition, she was removed some distance to Penge, where she died on

the day following her removal. She was seen at Penge by a medical man a few hours previous to death. At the post-mortem examination the following appearances were found—the body was greatly emaciated and was covered with vermin; the entire weight was seventy-four pounds, although two and a half years previously she weighed one hundred and nineteen pounds. The skin was dry and parchment-like, and the muscles were generally atrophied. The stomach was contracted and its walls thinned; the intestines were shrivelled, empty and transparent; the rectum was hyperæmic; and the omentum was much contracted and quite destitute of fat. The only appearances of disease were a small patch of tubercular deposit at the apex of the left lung, and a few miliary tubercles on the arachnoid membrane at the upper surface of the left side of the brain. From their examination of the body, the medical witnesses for the prosecution came to the conclusions that there was no disease sufficient to account for the extreme emaciation, or sufficient to cause death; and that the appearances were those indicative of death from starvation. For the defence, it was urged that tubercular meningitis was responsible for the emaciation and other symptoms of starvation. The general evidence, however, led the jury to return a verdict of wilful murder against all the prisoners. The evidence given at the trial was subsequently much discussed and criticised. There was a feeling amongst some medical men that proof of death from starvation was not, by any means, complete. It was objected that proper and careful search for other possible causes of death had not been made. For instance, the œsophagus had not been examined for stricture, the urine in the bladder had not been tested for sugar, and the suprarenal bodies had not been examined for disease. In consequence of the strong expression of public opinion, and for other reasons, Alice Rhodes was pardoned, and the capital sentences passed on the other three prisoners were commuted. This case serves to indicate the extreme importance of making a thorough and exhaustive examination of a body when a

post-mortem examination is being made for medico-legal purposes.

It will be well to enumerate here the principal organic diseases which may produce wasting and death, closely simulating the appearances produced by starvation ; for signs of these diseases careful search should always be made in suspected cases of death from starvation. They are stricture or compression of the œsophagus, malignant disease in any part of the body, tubercular disease, diabetes, dysentery or chronic diarrhoea, and disease of the suprarenal bodies. In addition, certain neuroses, such as hysteria or some form of insanity, which leave no post-mortem signs of their occurrence, may have been responsible for the general wasting.

ASPHYXIA

CHAPTER XXXI

Various forms of death from asphyxia—General symptoms produced by asphyxia—Drowning—Post-mortem appearances of drowning—Accidental, homicidal, and suicidal drowning—Treatment of the apparently drowned—Determination of length of time a body has been under water.

THE different forms of death from asphyxia comprise death from drowning, hanging, strangulation, and suffocation, in all of which death is chiefly due to asphyxia. All of these forms of violent death possess many features in common, although they are distinguished by individual peculiarities. They will each be dealt with separately and in detail, but previous to their separate description it is advisable to consider their common features.

By **asphyxia** is meant the non-aeration, or the imperfect aeration, of the blood from want of a proper supply of fresh air, by which means the function of respiration becomes arrested. This condition may be brought about by various means—by water occupying the place of air in the air-passages, as in drowning; by a ligature around the throat, as in hanging and strangling; by mechanical pressure upon the throat, as in throttling; or by blocking of the upper air-passages with some mechanical impediment to the entry of air, as in suffocation. Death from asphyxia is not instantaneous, as the heart may continue to beat for two or three minutes, or even longer, after the cessation of breathing; it is during this period that the

opportunity occurs for the resuscitation of the asphyxiated and apparently dead. After cessation of the heart's action recovery is practically impossible.

GENERAL SYMPTOMS PRODUCED BY ASPHYXIA

For convenience these may be divided into the following four periods:—

1. **A period of sensibility.**—This is brief, and during it severe though ineffectual efforts at breathing are made. The knowledge that this stage of consciousness is very brief is derived from the statements of persons who have been rescued from drowning, or who have been cut down from hanging, or who have experimented upon themselves by partial strangulation. During this period the senses may be unusually active, and the memory abnormally acute, so that many of the events of a lifetime may appear to be crowded into a few moments.

2. **A period of insensibility.**—During this period convulsive spasms occur. They are involuntary, and are caused by the stimulation of the nervous centres in the brain and spinal cord by the imperfectly aerated blood.

3. **Arrest of respiration.**—This is the period of apparent death; the action of the heart continues, and it is during this period that the asphyxiated person may be resuscitated.

4. **Arrest of the heart's action.**—The advent of this stage means death.

From the beginning to the end of these stages ten minutes may be taken as the outside limit in the great majority of cases; frequently the time is much shorter.

GENERAL POST-MORTEM APPEARANCES INDICATIVE OF DEATH FROM ASPHYXIA

1. There is more or less lividity of the lips, face, extremities, and surface generally.

2. The cadaveric lividities or post-mortem stains are usually of a darker colour than those found in other forms of death.

3. The blood is usually dark coloured and fluid.
4. The veins are filled with dark-coloured blood, while the arteries are generally empty.
5. The right side of the heart is usually full of dark fluid blood, the left side being more or less empty,
6. The lungs are mostly gorged with blood.
7. Minute extravasations of blood are frequently found beneath the pleuræ, pericardium, and peritoneum. The small sub-pleural extravasations of blood are very suggestive of death from asphyxia, but, at the same time, it must be borne in mind that their absence does not contra-indicate death from asphyxia, as in several such cases of death they have not been present. They are produced by rupture of capillaries, from the forcible attempts at respiration after the entry of air is shut off, the rupture being aided possibly by increased blood-pressure caused by stimulation of the vaso-motor centre. On the other hand, it should be remembered that such extravasations are sometimes found after other modes of death than asphyxia;—for instance, after death from some poisons, from burns, and from hæmorrhagic diseases such as scurvy, purpura, &c.
8. The vessels of the membranes of the brain and of the brain itself are congested.
9. The abdominal viscera generally are enlarged from engorgement with dark venous blood. This condition is, as a rule, especially apparent in the liver, spleen, and kidneys.

DROWNING

Drowning is that special form of death from asphyxia in which the breathing is arrested by the prevention of the introduction of air into the lungs by water or some other liquid. In order to cause death by drowning, it is not necessary that the whole body should be submerged. Drowning may result from merely the nose and mouth being beneath the surface of the fluid, as is illustrated by the facts that drunkards and persons in epileptic fits have been drowned by falling with their faces

into very shallow pools, from which they have been unable to extricate themselves. In drowning, air escapes from the lungs, and its place is taken by water drawn in by the inspiratory efforts; the consequence is that the blood circulating through the lungs is not able to get rid of its charge of carbon dioxide, and is, at the same time, unable to take up its normal supply of oxygen. It, therefore, circulates in a non-aerated or deficiently aerated condition, in which state it is incapable of maintaining the vitality of the nervous centres, the suspension of the action of which produces, firstly, arrest of respiration, and, finally, arrest of the heart's action.

In drowning, death is not only caused by deprivation of air, but another factor is operative in the physical changes that are produced in the lungs by the aspiration of water into the minute air-tubes and pulmonary vesicles. Some experiments performed by a committee of the Medico-Chirurgical Society of London demonstrated this, and also proved that drowning is not only more quickly fatal to life than ordinary suffocation, but that the chances of recovery are lessened, on account of the physical changes produced in the lungs. These conclusions were derived from the following experiments, the account of which is taken from Taylor and Stevenson¹:—‘Two dogs of the same size were submerged at the same moment, but one had his windpipe plugged, so that no air or water could enter, while the other had not. After *two minutes* they were taken out together; the one with the windpipe plugged recovered at once, the other died. In three experiments dogs with their windpipes plugged were kept below water for *four minutes*; the animals recovered perfectly when removed from the water. An inspection of the bodies at once revealed the difference. In animals simply deprived of air by plugging the windpipe, the lungs were merely congested; but in those which were submerged in their ordinary condition, the lungs, besides being more congested and showing ecchymosed points on the surface and in the substance, contained in their bronchial tubes a bloody mucous

¹ *Med. Jurispr.*, vol. ii.

froth formed of water, blood, and mucus, which completely filled the small air-tubes. The violent respiratory efforts made by the animal before death had caused the production of this froth, which formed a mechanical impediment to the entrance of air. This mucous froth or foam issued from the lungs on section, and appeared to penetrate their entire substance, which was saturated with water tinged with blood. The lungs were sodden, heavy, doughy, retained an impression produced by the finger, and were incapable of collapsing. In the lungs of animals which recovered after a short submersion, little or none of this mucous froth was found in the air-cells. In the fatal cases, the quantity was great in proportion to the time of submersion. There is no doubt that this froth is produced by the violent efforts to breathe, which are made within a minute after submersion.'

From these experiments it is evident that the chances of recovery after partial drowning are mainly dependent upon the quantity of mucous froth in the air-tubes and pulmonary vesicles, and also upon the amount of penetration of the substance of the lungs with water. If the quantity be large, the chance of recovery is slight; if the quantity be small, then there is good hope of recovery.

Post-mortem appearances of drowning.—There is little difficulty in deciding whether death was due to drowning, provided the body has been taken out of the water within a few hours after death, and provided that only a short interval elapses between its removal from the water and the inspection. If, however, the body has remained in the water till putrefactive changes have advanced, then it may be exceedingly difficult, or absolutely impossible, to determine whether death was caused by drowning. If the body has been in the water for only a few hours, and the inspection is made immediately on its removal, the following signs of death from drowning may be present. For the sake of convenience they are divided into the *external* and *internal* appearances.

External appearances.—I. The advent of **cadaveric rigidity**

is usually early ; in some cases it comes on immediately after immersion, so that the limbs may be fixed in the position they were last in during life.

II. The **face** is pale, or occasionally presents bright rosy-red patches, which may also be present on the front of the neck. The eyes are half open, the eyelids livid, and the pupils dilated. The mouth is partially open, and the tongue is frequently swollen and congested ; the expression is generally placid.

III. The **skin** is cold and pale, and frequently presents the appearance known as 'goose-skin' (*cutis anserina*), a condition, however, which is met with in several other forms of death from sudden shock or violence. This condition of the skin results from a vital act, and is therefore a fairly sure sign that the body was living when immersed in the water ; it is due to the occurrence of instantaneous cadaveric rigidity in the *arrectores pilorum* when in a state of contraction. The skin of the palms of the hands and of the soles of the feet is sodden and wrinkled, from imbibition of water. This only indicates that the body had been in the water for several hours at least.

IV. The **lips and nostrils** are covered with a fine mucous froth which oozes from them ; this froth resembles in appearance the lather of soap. It is visible about the mouth and nostrils of the recently drowned, but soon becomes dissipated on exposure to the air. It may be white or blood-stained, the colour, in the latter case, being due to infiltration of blood-colouring matter, derived from small extravasations in the parenchyma of the lungs. It does not continue for an indefinite period in submerged bodies, its average duration being about four days in winter and about three in summer ; if it has disappeared from the lips, a little pressure on the chest will sometimes cause it to appear at the mouth or nostrils. Draper¹ states that it is found after drowning in all media ; for instance, he has seen it in the case of an infant drowned in a cesspool.

V. The **fingers** and surface of the body frequently present abrasions. Gravel, sand, mud, weeds, or other substances may

¹ *Boston Med. and Surg. Reporter*, 1885.

be found grasped in the hands or imbedded under the nails, as the drowning person frequently grasps at any object within reach. After the removal of a body from water in which it has lain for twenty-four hours or more, bruises, though present, may yet not be visible on account of imbibition by the skin; as the skin dries they become visible.

VI. The **penis** is occasionally found contracted and retracted. This, being a vital act, is regarded by Casper and Kanzler as a positive sign that death resulted from drowning. This condition, however, is not by any means always present. Ogston states that he has met with it in six cases of drowning, but that in two cases he found the penis in a state of erection, and in twenty-two cases in a state of semi-erection.

Internal appearances.—I. The **lungs** are congested and œdematous, and generally occupy a larger volume than the normal. When the thorax is opened, the lungs protrude so as to fill the aperture made by the removal of the sternum and costal cartilages, and they almost cover the pericardium—a condition which is sometimes known as ‘ballooning’ of the lungs. Owing to their œdematous condition, their usual elasticity is lost, so that an impression made upon them by a finger remains for some little time. On section, a bloody, frothy liquid escapes. A mucous froth is present in the air-passages, which may be white or blood-stained. The presence of this froth in the air-tubes, together with the sodden condition of the lungs, is one of the most positive signs of death by drowning. Its absence, however, is not to be taken as contra-indicating death from drowning, since it has not been found in the bodies of persons who have sunk at once in the water, and have never risen to the surface to breathe. Ogston states that in nearly half the cases he examined no water was found in the lungs, and he believes that its absence is sometimes to be accounted for by transudation from the lungs into the pleural cavities, where it was found in quantities varying from one to thirty-four ounces. It should be carefully borne in mind that this mucous froth in the air-passages is not seen after long immer-

sion of the body, nor after long exposure of it to the air, nor after the onset of marked putrefactive changes.

Two views are held with regard to the œdematous condition of the lungs after death from drowning. One view is that it is due to infiltration of the parenchyma of the lungs with some of the water in which the drowning takes place. The other view is that œdema is due to transudation from the blood-vessels. According to Paltauf,¹ the water is drawn into the pulmonary alveoli during attempts at inspiration, and thence passes by the lymph-spaces, and occasionally through small lesions in the alveolar walls, into the interstitial alveolar, subpleural, peribronchial, and perivascular connective tissues. According to Lesser,² the aspiration of water into the air-passages causes a secretion of mucus, which blocks the finer bronchi, and so prevents the entry of any appreciable quantity of water into the pulmonary alveoli. In his opinion, any fluid that may be present in the parenchyma of the lungs is derived from the blood-vessels as a vital exudation product.

The presence of the mucous froth in the air-tubes depends on the retention of air in thin vesicles. As previously mentioned, it may have disappeared after three or four days' submersion, or if the body be not inspected within a short time of its removal from the water, or if it be exposed to a high temperature. When putrefactive changes are fairly advanced, the mucous froth disappears, and at a certain stage of putrefaction the lungs collapse on opening the thorax, or are found in a collapsed condition. Since the formation of the froth is due to the churning of air and water by the respiratory movements, if a person on falling into the water dies from syncope (accompanied by sudden stoppage of respiration), no froth will be present. If a dead body be thrown into water, no mucous froth will be found in the air-tubes. Orfila's experiments show that water may penetrate into the larger bronchial tubes after death,

¹ *Ueber den Tod durch Ertrinken*, 1888.

² *Atlas d. ger. Med.*, 1891; and *Vierteljahrsschr. f. ger. Med.*, 1884.

but not into the pulmonary vesicles, and that in such cases there is no accompaniment of mucous froth in the air-tubes.

II. The right side of the **heart** is generally found filled with blood, while the left side is more or less empty. Occasionally the right side is found empty; or both sides may be equally full.

III. The **blood** is usually dark and fluid, and, as in other cases of death from asphyxia, contains but little oxygen. The fluidity of the blood, according to Brouardel, is due to dilution with water, which may take place to the extent of one-third or one-fourth of the total weight of the blood. The absorption of the water into the circulation takes place partly from the lungs into the pulmonary circulation, and partly from the stomach into the portal circulation, as the stomach, in cases of drowning, usually contains a quantity of swallowed water. The blood, therefore, in the left side of the heart is more dilute than in the right side, owing to the blood, as it passes through the lungs, receiving an additional supply of water; the blood in the portal vein may also be much diluted, owing to absorption of water from the stomach. The dilution of the blood is much greater in cases where the person dies slowly, and after coming to the surface frequently, than when from syncope the person immediately sinks to the bottom. The blood is usually found fluid after death from drowning, as is the case in other modes of death from asphyxia; but this fluidity is not due to absence of coagulation, but to post-mortem decoagulation. The dilution of the blood with water is no obstacle to coagulation; but if one or two days elapse after death before the post-mortem examination is made, the coagulation will have passed away, and the blood will be again fluid. The liquefaction of the coagulated blood occurs in the following order: first in the right side of the heart, then in the thoracic vena cava, the left side of the heart, the abdominal vena cava, and, lastly and much later, in the portal vein.

IV. The **stomach** generally contains swallowed water, and in it may be found sand, mud, weeds, or other substances

corresponding with those existing in the water in which the drowning took place. The quantity of water found in the stomachs of drowned persons varies considerably. It was found to be greater in an animal that was allowed to come to the surface frequently than in one kept completely submerged, as in the latter the power of swallowing was sooner lost, owing to the earlier occurrence of asphyxia.

Water is not invariably found in the stomach after death from drowning, since in cases where syncope occurred at the moment of immersion no water would be swallowed, so that the absence of water from the stomach is not to be taken as disproving drowning. On the other hand, although the presence of water in the stomach does constitute an important sign of death from drowning, yet of itself it is not a positive indication of such form of death, since it may have been swallowed before immersion, or the water may possibly have found its way into the stomach after death, from the body lying submerged. Although the possibility of this latter condition has been denied by some writers, yet the experiments of Obolonsky¹ show that it is quite possible for water to find its way into the stomach of a body placed in water after death has occurred. He placed in coloured water the bodies of eighteen children, varying from two weeks to two months old, weighted so as to keep them submerged. After periods of one to three days their stomachs were opened. In three of the bodies a considerable quantity of the coloured water was found in the stomach, in two others only a small quantity, while in the remaining thirteen no water was found in the stomach. The five bodies, in the stomachs of which water was found, had been submerged for seventy-two hours, so that it may be taken that the longer a body has been in the water, the less valuable as a sign of death from drowning is the presence of water in the stomach or intestines.

The mucous membrane of the stomach and intestines is sometimes much discoloured in drowned subjects; and if the

¹ *Vierteljahrsschr. f. ger. Med.*, 1888.

body has been a long time in the water, the mucous membrane may be of a deep violet or brown colour. According to Orfila, if drowning take place while digestion is going on, the mucous membrane of the stomach frequently has a pinkish or violet tint. The remembrance of these colour-changes is important, as they might lead to the suspicion of irritant poisoning. Occasionally, when drowning has occurred after a full meal, vomiting takes place, and the vomited matters may be found in the windpipe and lungs. This would be conclusive evidence that the person must have been alive at the time.

The question as to whether death was caused by drowning is an important one for a medical witness to answer, as it is quite possible that cases of murder are not unfrequently overlooked in the inspection of bodies found in water. The medical deduction that death was due to drowning is based, not upon a single fact, but upon a series of facts, to which, individually, objections might be raised, but which, taken collectively, furnish strong evidence as to the cause of death. To briefly recapitulate, the principal indications that death was caused by drowning are:—

I. Froth found about the lips and nostrils, or obtained on compression of the chest.

II. Goose-skin, or *cutis anserina*.

III. Mucous froth in the air-passages.

IV. A watery and bulky condition of the lungs.

V. The presence of water in the stomach.

Accidental, homicidal, and suicidal drowning.—The question of accident, homicide, or suicide has to be determined, if possible, whenever an investigation is taking place on a drowned person. Homicidal drowning is rare, except in the case of infants. In the year 1892, according to the Registrar-General's Report, 3,239 deaths from drowning occurred in the United Kingdom. Of these **accident** caused 2,637—2,231 males and 406 females; **suicide** 584—343 males and 241 females; **murder** and **man-slaughter** 18—7 males and 11 females. The much larger number of deaths among the male sex from accidental drown-

ing is accounted for by occupation-risks affecting men much more than women.

Homicidal drowning may be denoted by the presence of marks of violence on the body, which cannot be explained by any post-mortem influence. It should be borne in mind, however, that determined suicides frequently inflict severe and dangerous wounds upon themselves, and then terminate their lives by drowning. Such cases might possibly be mistaken for homicide.

✓ Suicides occasionally attach weights to the body, or tie the hands and feet, in order to more effectually insure death from drowning. If the hands and feet are found tied, and the signs of death from drowning are present, the inference is that it is a case of suicide, provided that marks of violence suggestive of foul play are absent. If the hands and feet are found tied, and the signs of death from drowning are absent, the inference would be that the body was placed in the water after the occurrence of death. If a body be found in shallow water, with the signs of death from drowning, it is no indication that it was not a case of suicide.

Many instances have occurred of suicide by drowning in very shallow water. An instance occurred in the author's experience of a woman committing suicide in a small house-cistern; the water in the cistern was only two feet deep, and in order to get into it the woman had to curl herself up upon her side, previously replacing the lid of the cistern so as to give no indication of its having been raised. Taylor and Stevenson mention the two following cases of suicide by drowning in shallow water. A woman committed suicide by breaking a hole in the ice of a pond during the winter, and thrusting her head into the water, the rest of her body being out. A man was found dead with his face downwards in a small stream of water only six inches deep. The water was so shallow that it did not cover the deceased's body or his head. There was clear evidence that this was a case of suicidal drowning.

✓ **Marks of violence on the drowned.**—These naturally give

rise to a suspicion of foul play, but in examining them with the object, if possible, of determining their causation, due consideration should be given to the possibility of their being the result of accidental violence, which the deceased may have met with in the act of falling into the water, or to which the body may have been exposed while floating in the water. For instance, considerable ecchymoses, lacerations, and fractures may be caused by a body carried by a current against stakes, piles, buttresses of bridges, rocks, &c., or by its being crushed between lock-gates, barges, &c. The wounds may present the appearances of their having been inflicted after death (see pp. 21 and 22). If injuries to vital organs are found which, from their nature, must of necessity have proved immediately fatal, and yet the obvious signs of death from drowning are present, then there can be no doubt that the injuries were produced on the body after death. It should also be remembered that a person in falling or jumping from a height into water may receive severe injuries either by striking against some projection, or by mere impact with the water. For instance, a person jumped off London Bridge and fell into the water feet first, the arms being at the time at right angles to the trunk; both arms were dislocated at the shoulder-joints. Ogston relates the case of a woman who leapt from a bridge, and whose perineum was lacerated by forcible separation of the thighs on coming in contact with the water. The sudden impact of a body with water may produce rupture of a vessel, and consequent effusion of blood into the cavities of the head, thorax, or abdomen. The fact should not be forgotten that the marks of violence may have been self-inflicted in an attempt at suicide previous to self-destruction by drowning.

Primary causes of death from drowning. I. *Asphyxia*.—The most common cause.

II. *Syncope*.—Caused by shock, fright, &c.

III. *Exhaustion*.—One of the causes of death from drowning in the case of swimmers.

IV. *Concussion*.—May be the result of collision with the bed

of the river, with rocks or posts, or even with the surface of the water.

V. *Cerebral hæmorrhage*.—May be caused by violent struggles after immersion.

VI. *Cramp*.—This condition may extend to the muscles of respiration, and even perhaps to the heart.

Period in which death takes place from drowning.—Asphyxia usually occurs in a minute to a minute and a half after submersion, and death, from cessation of the heart's action, generally takes place a minute or two later. Two minutes may be taken as the outside period for the commencement of asphyxia, and from four to five minutes after submersion as the ordinary time when death occurs. If the submersion has been complete for four minutes, recovery is probably hopeless, unless syncope occurred at the moment of falling into the water, in which case no great amount of water will have been drawn into the air-tubes.

The great majority of expert divers, such as sponge-divers and pearl-divers, cannot remain below the surface of water much longer than one minute. A few persons, partly by long practice and partly perhaps from the possession of some inherent condition, have acquired the power of remaining below the surface of water for several minutes; these are merely exceptional cases in which practice has enabled them to postpone the onset of asphyxia beyond the usual limit. Pope¹ records the following exceptional case of recovery after a prolonged period of submersion:—A man was sailing in a boat when it capsized and he fell into the water with some weights on the top of him, so that, with the exception of his left arm, he was entirely and continuously submerged for from twelve to fifteen minutes; he was resuscitated with considerable difficulty, and eventually recovered. The favourable issue was attributed to the weights pressing on the chest, which, together with the concussion, so interfered with respiration as to prevent any water entering the lungs.

¹ *The Lancet*, 1881.

With regard to the sensations experienced by persons while drowning, the following accounts¹ are of interest. Admiral Beaufort when a boy fell overboard in Portsmouth Harbour, and before relief reached him had sunk below the surface. The following description was afterwards given by him :—

From the moment that all exertion had ceased, a calm feeling of the most perfect tranquillity superseded the previous tumultuous sensations—it might be called apathy, certainly not resignation, for drowning no longer appeared to be an evil. I no longer thought of being rescued, nor was I in any bodily pain. On the contrary, my sensations were now of a pleasurable cast, partaking of that dull but contented sort of feeling which precedes the sleep produced by fatigue. Though the senses were thus deadened, not so the mind; its activity seemed to be invigorated in a ratio which defies all description, for thought rose after thought with a rapidity of succession that is not only indescribable, but probably inconceivable by anyone who has not himself been in a similar situation. The course of these thoughts I can even now in a great measure retrace—the event which had just taken place, the awkwardness that had produced it, the bustle it must have occasioned, the effect it would have on a most affectionate father, and a thousand other circumstances minutely associated with home, were the first series of reflections that occurred. They then took a wider range—our last cruise, a former voyage and shipwreck, my school, the progress I had made there and the time I had misspent, and even all my boyish pursuits and adventures. Thus travelling backwards, every past incident of my life seemed to glance across my recollection in retrograde succession; not, however, in mere outline as here stated, but the picture filled up with every minute and collateral feature; in short, the whole period of my existence seemed to be placed before me in a kind of panoramic review, and each act of it seemed to be accompanied by a consciousness of right and wrong, or by some reflection on its cause or its consequences; indeed, many trifling events which had been long forgotten then crowded into my imagination, and with the character of recent familiarity.

Two minutes did not elapse before he was hauled up; and he found the return to life much less pleasant than drowning.

The following is an account of the sensations experienced by a gentleman while drowning :—

He lay at the bottom of a river in a state of semi-consciousness, in which he saw his relatives and friends all about him with their eyes full of tears. All the events of his life, from infancy upwards, passed slowly

¹ *Brit. Med. Jour.*, 1894.

before his mental vision; he felt that he was drowning, and he remembers thinking, unlike Clarence, that it was not pain to drown. He was able even to speculate whether his body would be found, and he pictured his own funeral, and fancied he could hear the earth thrown on his coffin. He had sensations of the nature of tinnitus (ringing of bells, &c.) in his ears, and he had visual perceptions of the most marvellous combinations of colours. Next all was peace around him; he had a peculiar feeling of well-being in a medium of a temperature neither too hot nor too cold. Then he felt himself as if raised from the earth, and floating in space, and looking down on the world spread out at his feet. Lastly came mere darkness and oblivion, till he found himself stretched on the river bank and being subjected to the disagreeable process of restoration to life.

The following account is given by a lady who had a narrow escape from drowning in the sea:—

As I sank again I gasped involuntarily, and immediately all other sensations were overpowered by the agonising, scorching pain which followed the rush of salt water into my lungs. From that moment I was conscious only of that burning suffocation and the intense desire that the others might know what had become of me. Except for that one thought my brain was dulled. I had no vision of my past life, such as I have always believed a drowning person to experience. I was conscious of no fear of death, and no special desire to be saved. I had no thought of my children. There was a roaring in my ears, and a red mist before my eyes; but I neither saw visions nor dreamed dreams—I only suffered.

TREATMENT OF THE APPARENTLY DROWNED

As long as any movements of the heart continue there is a chance of recovering the apparently drowned, and even if the case should appear to be hopeless, attempts at resuscitation should be made, unless death has obviously occurred. Before air can be introduced into the lungs by artificial respiration, it is absolutely necessary to get rid of the water that has been drawn into the air tubes by aspiration, and of the mucus that has been secreted by the bronchial tubes as the result of the intrusion of the water. Otherwise, although the heart may continue to beat, the finer bronchi will be blocked by the mucus and water, and air will be precluded from reaching the pulmonary vesicles; so that if artificial respiration be attempted, the

mucus and water mixed with air will simply be churned to and fro in the air-passages.

Indications for the treatment of the apparently drowned.—

1. To clear the air-passages of water and mucus, and carry on artificial respiration.
2. To restore lost animal heat.
3. To stimulate the action of the heart.
4. To rouse the nervous centres.
5. To treat any inflammatory or other sequelæ.

The treatment should be commenced at once, the chance of resuscitation diminishing with every moment that is lost. Bystanders should be despatched for blankets, dry clothing and hot things. Articles of clothing should be removed from the neck and chest of the patient, who should then be turned face downwards for a few seconds, a roll of clothing being placed under the chest and stomach so that the head is at a lower level than the chest. Firm pressure is then made for a few seconds on the back, so as to squeeze the chest and compress the lungs, by which means water and mucus are squeezed out of the air-passages and escape by the mouth and nostrils. The body is then turned over on its back, the roll of clothing being placed beneath the shoulder blades; any froth about the mouth and nostrils is wiped away, the tongue is pulled forward, and artificial respiration is commenced. The following are the principal methods for the performance of artificial respiration:—

Silvester's method.—The operator should stand or kneel at the head of the patient and grasp the forearms just below the elbows, and should then draw the patient's arms outwards and upwards until they nearly meet above the head, keeping them in that position and on the stretch for two seconds; the arms are then to be lowered to the sides of the chest, which by pressure of the patient's elbows and arms are to be well compressed, this act also taking about two seconds. The first movement is that of artificial inspiration, the second that of expiration. The movements should be repeated about fifteen times a minute (not more quickly) until

natural breathing occurs, or until it is obvious that resuscitation is hopeless.

Howard's method.—This is a less fatiguing process of artificial respiration than Silvester's for one person to carry on. The operator should kneel astride of the patient, the knees being on either side of the patient's hips; the operator's elbows should be steadied against his own hips, and his hands placed on the lower part of the patient's chest on either side of the sternum. The operator then bends slowly forwards, bringing his weight to bear upon the patient's chest, until his face is near the patient's, when, with a sudden push on the sides of the chest, he jerks himself backwards. He should then pause for three seconds and repeat the process, which should be carried on at the rate of about eight or ten times a minute. The first movement is that of artificial expiration, the second that of inspiration.

Laborde's method.¹—This method, which has only recently been discovered, is exceedingly simple, and has been reported as being very successful in its results. Laborde calls it 'traction of the tongue.' It consists in seizing the tongue, pulling it out of the mouth, and making rhythmical traction on it, imitating the respiratory rhythm. The process should be kept up for a long time; if successful, the person gives a deep sigh—sometimes vomiting occurs—and after that, if the traction be continued, respiration is usually speedily restored. Reflex hiccough frequently occurs, then spontaneous contractions of the diaphragm, and finally re-establishment of respiration. Laborde suggests that the process depends on the excitement of a reflex act by the rhythmical traction of the superior laryngeal nerve. Another suggested explanation is that it is due to stimulation of the glosso-pharyngeal or lingual nerve—or both—liberating a reflex from the respiratory centre.

The further treatment consists in the removal of the wet clothes, the drying of the body, friction of the lower extremities, and wrapping in hot blankets. If resuscitation occur, a little

¹ *Rev. Gén. de Méd.*, 1892.

warm brandy and water should be given as soon as the patient can swallow, and later warm milk, coffee, and beef-tea may be administered. Artificial respiration should be persisted in until the lips and extremities have quite lost their cyanosed appearance.

DETERMINATION OF THE LENGTH OF TIME A BODY HAS
BEEN UNDER WATER.

It is sometimes very difficult to give more than an approximate answer to the question as to how long a body has been under water. The rate of change in the body is considerably determined by surrounding conditions. In hot weather, in putrid water, and in shallow water the changes proceed rapidly ; on the other hand, in cold weather, in salt water, and when the body is closely invested by clothing the changes are much slower. The table on p. 124, which must be regarded as giving average results only, is mainly compiled from the recorded observations of Devergie¹ on bodies taken out of the Seine and brought to the Paris Morgue.

Time of floating of the body.—The human body is slightly heavier than water, but the development of a small amount of the gases of putrefaction causes it to become lighter than water, and so enables it to float. In this country a body floats as a rule after from three to eight days' submersion. The time, however, at which the bodies of the drowned will float depends upon the following circumstances :—(i) *The temperature.*—The higher the temperature of the air and the water, the more rapid is the development of putrefactive changes, so that in hot summer weather the body may rise within twenty-four hours. (ii) *The water.*—Bodies rise more rapidly in salt water than in fresh, and sooner in shallow than in deep water. (iii) *The age of the drowned person.*—The bodies of infants and young children rise quickly, on account of the greater proportion of fat, and the lightness of the bones ; in cases of infanticide by drowning,

¹ *Ann. d'Hyg.*, vols. ii. v. vi.

the body of an infant that has respired will rise very speedily, and possibly may not sink at all. (iv) *The corpulence of the body*.—The specific gravity of the body is diminished by fat, so

Appearance and condition of the drowned body	The inference is that death has occurred :
Little change. Rigor mortis may persist to 4th day	1 to 4 days
Skin of the palms and the lateral surfaces of the fingers begin to whiten	4 to 5 days
Extension of whitening of skin to soles of feet and to skin of face	6 to 8 days
Face red and slightly swollen. Green spot on skin of mid-sternum. Skin of hands and feet white and wrinkled. Cortical substance of brain green	About 15 days
Face reddish-brown. Neck, lips and eyelids green. Upper and mid-sternal regions brown, with green margin. Skin very wrinkled. Scrotum and penis much distended with gases. Lungs loaded with gases of putrefaction	About 1 month
Commencing detachment of the cuticle at the wrists	About 6 to 7 weeks
Face enormously swollen and brown. No change of colour of skin of abdomen and extremities. Skin, with nails attached, beginning to separate from hands and feet	About 2 months
Skin of extremities green. The nails detached from hands and feet. Some adipocere in breasts, cheeks, axillæ, and inner parts of thighs. Abdomen much distended with gases	About 2½ months
Features indistinguishable. Skin of abdomen green. Hands and feet bare of skin	About 3½ months
Portions of the skull bare. The remains of the face and neck converted into adipocere. Adipocere commencing to form in the brain	About 4½ months

that fat bodies rise more quickly than lean ones. (v) *The sex*.—The bodies of women float, as a rule, sooner than those of men, on account of the bones being lighter, and the greater proportion of fat that is usually present. (vi) *Weights about the body and other mechanical impediments to its rising*.—Such as being entangled in weeds or held by ropes, chains, &c.

CHAPTER XXXII

Hanging—Post-mortem appearances of death from hanging—Accidental, homicidal, and suicidal hanging—Strangulation—Post-mortem appearances of death from strangulation—Accidental, homicidal, and suicidal strangulation—Suffocation—Various modes of death by suffocation.

HANGING

HANGING is that mode of death caused by the partial or entire suspension of the body by the neck, the constricting force being the weight, or partial weight, of the body itself—in strangulation the constricting force is due to some other cause. In order that death should be caused by hanging, it is not necessary that the body should be entirely clear of the ground or other means of support, nor is it necessary that the body should be in the upright posture; a comparatively slight degree of tension on the ligature, such as that caused by partial suspension, is sufficient to cause death.

Cause of death from hanging.—Death usually results from asphyxia, but if the constricting force of the cord or rope be not great, or if its pressure be exerted high up on the neck, above the larynx, then a small quantity of air may still be able to reach the lungs—in such a case death is caused by compression of the great vessels of the neck, causing an interruption in the blood-supply to the brain, and this arrest of the intra-cranial circulation may be the main cause of death. It is very rarely that cerebral hæmorrhage takes place. Arrest of the cerebral circulation from compression of the great vessels of the neck produces very rapid loss of consciousness. The accounts given by those who have been suspended for a sufficiently long time

to produce complete unconsciousness, but who have been cut down in time and have recovered, are generally to the effect that they were first conscious of loss of power to make any movements of the limbs, this loss of power being sometimes preceded by subjective visual and auditory sensations (such as flashes of light and a roaring, rushing, or hissing sound), and that afterwards darkness appeared to come on, and consciousness left them. This sudden loss of power and rapid onset of unconsciousness explains why in accidental and in many cases of suicidal hanging no attempt is made by the victim to save himself, when a slight movement might be sufficient to avert the fatal result. As previously stated, death from hanging may be due to asphyxia, or to arrest of the cerebral circulation, or, as is usually the case, to both causes combined. It is not, however, possible at a post-mortem examination of a case of death from hanging to gauge the relative importance of asphyxia and of arrest of cerebral circulation, as the cause of death. The question as to which occurs first, arrest of respiration or of the heart's action, is easily answered. There is abundant evidence to prove that the heart continues to beat for some time after cessation of respiration produced by hanging. M'Causland¹ made some observations on a criminal executed by hanging, the rate of the pulse being taken every quarter of a minute after suspension. At the third quarter of the first minute it equalled 40 heart-beats per minute; at the last quarter of the fifth minute 152. The radial pulsation became less distinct until the end of the seventh minute, when it could no longer be felt. With the stethoscope the heart-beats could be heard during the eleventh minute at a rate of 120 per minute; at the end of the fourteenth minute the heart was still heard, but it was weak and fluttering; at the fifteenth minute it had ceased to beat. In other and similar cases the heart has been heard to beat for four, five, seven and a half, eight, and twenty minutes respectively after suspension. Hofmann² attributes the rapid loss of consciousness, and the final cessation of the

¹ *Philadelphia Med. and Surg. Reporter*, 1883. ² *Jour. de Méd.*, 1878.

heart's action, to pressure on the vagi and the large vessels in the neck. Probably, however, pressure on the vagi has not much to do with the cause of death by hanging, as Misuraca¹ found that, after tying both vagi in dogs, death did not take place till from fourteen hours to seven days afterwards. In a few exceptional cases of judicial hanging, displacement of the odontoid process or fractures of cervical vertebræ have occurred, followed by sudden compression of the spinal cord; such cases, however, are very rare.

When the ligature is above the thyroid cartilage, slight constriction is sufficient to close the air-passages. From experiments made by Langreuter² on dead bodies, the subjects having died from natural causes, it was found that, when a cord was placed round the throat, between the thyroid cartilage and the hyoid bone, moderate traction in the long axis of the body caused the epiglottis to be pushed against the posterior wall of the pharynx, and stronger traction forced the base of the tongue in the same direction; only moderate force was necessary to completely close the air-passage. Ecker³ demonstrated similar results with the body of a man found hanging from a tree in winter, and which was frozen so hard as to be easily sawn into vertical sections. The soft structures at the posterior part of the floor of the mouth were doubled up into the cavity of the pharynx so as to completely fill and obliterate the naso-pharyngeal passage.

Rapidity of death from hanging.—As previously mentioned on p. 127, unconsciousness from asphyxia due to hanging comes on very speedily and insidiously, and is accompanied with but little suffering. Such, at all events, is the testimony of those who have been resuscitated, as well as of those who have performed experiments upon themselves. The convulsions that frequently occur in the case of criminals judicially hanged are probably due to the irritating effect of the deficiently oxygenated blood on the convolutions and ganglia of the brain,

¹ *Revista Sperimentale*, 1889. ² *Vierteljahrsschr. f. ger. Med.*, 1886.

³ *Virchow's Arch.*, 1870.

and there is no reason to believe that the criminal suffers any pain, any more than an individual suffering from epileptic convulsions. Death from hanging may therefore be said to be rapid and almost painless, although, as previously stated, it must be remembered that the heart may continue to beat for some minutes after respiration has ceased.

Post-mortem appearances of death from hanging.—1. *Judicial hanging.*

I. The face is livid and swollen, the eyes are projecting, and the pupils are dilated.

II. The tongue is generally enlarged, and is sometimes protruded. There is frothy mucus or blood-stained froth about the lips and nostrils.

III. Around the neck there is often a deep ecchymosed impression.

IV. The urine, fæces, and seminal or prostatic fluid are sometimes involuntarily expelled at the moment of death.

2. *Suicidal hanging.*

I. The face is usually pale.

II. The tongue is protruded in about one-half of the cases. Saliva is sometimes found trickling from the mouth, down the chin and on to the breast.

III. The mark on the neck is usually a simple depression in the skin, and is generally free from ecchymosis, owing to less violence having been employed than in judicial hanging, it possesses a yellowish-brown colour and horny or parchment-like consistence if the ligature be hard (such as rope), or it may be pale and soft, or dusky-red or bluish in colour if the ligature be composed of a soft material (such as a handkerchief); the one mark may present in different places all these appearances. In the greater number of cases of death from hanging the ligature is situated above the thyroid cartilage. As a rule, the narrower the ligature, and the longer the suspension, the deeper is the furrow. The mark occasionally surrounds the neck entirely, but more frequently it is limited to the front half, running between the thyroid cartilage and the hyoid bone, and

passing upwards below and behind the ears, where it generally ceases. Very occasionally the mark may exist only on one side of the neck, owing to the position of the noose having been such as to cause the head to fall on one side instead of forwards, as usually occurs. The mark may occasionally be found running horizontally around the neck beneath the thyroid cartilage, owing either to the ligature having been tightly placed there, or possibly to a prominent cartilage preventing it from slipping upwards.

IV. The penis is occasionally found more or less erect, and emission of seminal or prostatic fluid may have occurred. In twenty-five per cent. of the cases examined by Ogston, there was more or less erection of the penis. On the other hand, Casper states that in none of the cases of suicidal hanging examined by him did he find erection of the male organ.

V. The mucous membrane of the epiglottis, larynx, and trachea is usually deeply congested, and is sometimes covered with a bloody froth. The lungs are generally more or less hyperæmic, but the amount of hyperæmia is probably dependent on the degree of inflation of the lungs at the moment of occlusion of the air-passage; some experiments made by Patenko¹ point to this conclusion. A number of dogs were hanged, some at the end of full inspiration, others at the end of full expiration. In those hanged at the end of full inspiration the lungs contained little blood, whereas in those hanged at the end of full expiration the lungs contained a great deal of blood. Sub-pleural extravasations of blood may be present as in other forms of death from asphyxia, and are more likely to be formed when occlusion of the air-passage takes place at the end of full expiration. As previously mentioned, they occur, however, in other modes of death (see p. 107).

VI. The right side of the heart is generally filled with dark fluid blood; if death has been mainly due to interference with the intra-cranial circulation, both sides of the heart will contain blood.

¹ *Annales d'Hygiène*, 1885.

VII. The vessels of the brain may be congested, but in rather more than half of the cases the amount of blood is normal; extravasation of blood either upon the membranes or into the substance of the brain is very rare. The hyperæmic condition of the brain varies inversely with the hyperæmia of the lungs; if death occur at the end of full inspiration, the lungs contain little blood, while the membranes of the brain and the sinuses of the skull contain a great deal; if death occur at the end of full expiration, the membranes of the brain and the sinuses of the skull contain little blood, while the lungs contain a great deal.

VIII. The mucous membrane of the stomach is often much injected, a condition which has been mistaken for the effects of an irritant poison, and a similar condition may be found in the intestines. Coagulated blood has been found on the mucous membrane of the stomach. The kidneys and liver may contain more blood than usual. The fulness of the vessels of the abdominal organs varies inversely with the condition of hyperæmia of the lungs; the more blood in the lungs, the less in the vessels of the abdominal organs, and *vice versa*.

Was death caused by hanging?—This is an important medico-legal question. The mere suspension of the body is no proof of death from hanging, since a murderer might suspend the body of his victim in order to divert suspicion from the true cause of death. If in the case of a body found suspended, a medical man should declare that death was not due to hanging, this would be equivalent to the declaration that it was a case of homicide, since it is most improbable that any but a murderer would hang up a recently dead person. The question as to whether death was caused by hanging cannot always be satisfactorily answered by medical evidence only, since there are no absolutely positive or characteristic signs of this mode of death. For instance, the punctiform ecchymoses that may be found on the lower parts of the body are of no value as indications of suspension during life. Again, the mark usually seen on the neck cannot be regarded as positive evidence of

death by hanging, since it can be produced by suspending a dead body by the neck, not only immediately after death, but also after an interval of several hours; while, on the other hand, death may result from hanging, and no mark around the neck may be visible, if the ligature be composed of some soft material such as a handkerchief, and if the traction on the neck, from incomplete suspension, has not been great. The presence of saliva trickling from the mouth, down the chin and on to the chest, is a valuable sign of death from hanging, but it is not present in all cases. The other signs, such as lividity of the face, swollen tongue, and the various internal appearances, are common to the other forms of death from asphyxia, and, moreover, many of them may be absent in certain cases of death from hanging.

With the exception, therefore, of the flow of saliva from the mouth—which is not a constant sign—there are no certain external or internal evidences that would justify the expression of an absolute opinion that death was due to hanging. But generally there is circumstantial evidence that is of assistance in arriving at a conclusion. As it is probable that only a murderer would suspend a recently dead body with the object of simulating the act of suicide, there would be about the body signs of some form of violent death other than that of hanging. If injuries of such a nature that they could not be self-inflicted are found upon a suspended body, presumptive evidence of homicide would be obtained. In connection with this, however, it must be borne in mind that suicides sometimes make many attempts on their lives by various means, and that after the failure of such, they may finally resort to hanging to terminate life; so that the mere presence of wounds upon a suspended dead body does not necessarily point to homicide, unless the wounds are of such a nature that they could not have been self-inflicted. Maschka relates several instances of self-inflicted wounds that were found on bodies in cases of suicidal hanging. In one case, several incised wounds were found on the inner side of the left fore-arm, one of which divided the radial artery.

In another case, a suicide discharged a firearm into his mouth, fracturing the hard palate, and lacerating the soft parts, and then hanged himself. In a third, an old woman, sixty years of age, attempted suicide by hanging, but was cut down before death occurred; on recovering consciousness, she seized a knife and cut her throat; at the post-mortem examination an ordinary cut-throat wound was found above the thyroid cartilage, and a cord-mark as well. Liman¹ records the case of a woman who inflicted on herself two wounds which penetrated the pericardium; she afterwards committed suicide by hanging.

Accidental, homicidal, and suicidal hanging.—In the year 1892, according to the Registrar-General's Report, 671 deaths from hanging occurred in the United Kingdom, cases of judicial hanging not being included in the number. All these 671 deaths from hanging were due to suicide—532 males and 139 females.

Accidental hanging.—This is a very rare cause of death, but it is possible. Maschka records a case of fatal accidental hanging in which a man, slightly under the influence of alcohol, slipped off a ladder and was caught in the noose of a rope hanging from the ceiling. Taylor and Stevenson relate the case of a girl, thirteen years of age, who was hanged by accident. She was swinging in a brewhouse, and near the swing a rope was suspended for drawing up slaughtered sheep. In the course of the exercise, her head got through a noose in this rope, which pulled her out of the swing, and kept her suspended at a considerable height until dead.

Homicidal hanging.—Hanging is but seldom resorted to for committing murder, owing to the facility with which resistance on the part of the assailed person would ordinarily prevent the completion of the act. It is possible, however, under any of the following conditions:—(i) When the victim is feeble and the assailant strong; (ii) when the victim is unconscious or incapable of resisting from being in a state of intoxication, stupefaction, or exhaustion; and (iii) when there are many

¹ *Handbuch d. ger. Med.*

assailants, as in cases of lynching. Ogston records a case in which a woman tied a ligature round the neck of her husband while he was asleep, and then pulled him up with it. In 1888 an exceptional case of homicidal hanging occurred in Paris, of which the following account is taken from Dixon Mann's 'Forensic Medicine.'¹ It was a murder committed by a man named Eyraud, with the aid of a female accomplice named Bompard. 'The girl formed an illicit connection with one Gouffé, who was the selected victim. In the alcove of a room where an interview was to take place between Gouffé and Bompard, Eyraud fixed a compound-pulley, over which a rope furnished with a strong hook was passed; the apparatus and the alcove were concealed by a curtain, behind which Eyraud was placed; in front of the alcove was a sofa. Whilst Gouffé was sitting on the sofa, the girl placed herself on his knee, and in a playful manner adjusted the noose of a silk cord round his neck, and then passed the free end of the cord (which was furnished with an eye or small loop) to her accomplice, who slipped the eye over the hook depending from the pulley, and pulled the rope to which it was attached until Gouffé was drawn up from the sitting posture and suspended by the neck; the rope was then made fast to the sofa so as to keep the body suspended. After robbing the corpse—which was the object of the murder—it was put into a box and taken to a distance, and there left. The body was discovered fourteen days after, and on examination it was found that both cornuæ of the hyoid bone were fractured. The culprits were ultimately arrested, and from the confession of Bompard the actual mode in which the deed was perpetrated became known.'

Even if the hands and feet of a hanged person are found tied, the inference that the act was homicidal is not warranted, as the hands and legs or feet have been found tied in cases of undoubted suicidal hanging. If, however, a person be found with hands and feet tied, and suspended from a position which

¹ *Lib. cit.*, p. 197.

obviously he could not have reached himself, then the presumption of homicide is justified.

Evidence as to whether the hanging was a homicidal or suicidal act may frequently be obtained by a careful observation of the body and its surroundings. Attention should be especially directed to the following points. (i) If the body be hanging in a room, it should be noted whether the doors and windows are secured on the inside or outside. (ii) Whether the dress of the deceased be torn or disarranged. (iii) The attitude of the body. (iv) Marks of blood on the body and about the room. (v) Whether the hands present marks of struggling or wounding. (vi) Whether the rope correspond to the impression around the neck.

Suicidal hanging.—Hanging is the commonest method of committing suicide. For death to occur from hanging it is not by any means necessary that the body should be entirely suspended or completely raised from the ground. Many cases of suicidal hanging have occurred in which the feet have been resting on the ground, and some even in which the body has been in the sitting posture. Marc quotes a number of such instances. In one of them a man committed suicide by hanging himself in a prison cell; he was found dead, nearly in a sitting position, his heels resting on the floor, and his body only a foot and a half above it. Grant¹ relates the case of a man, forty-eight years of age, who committed suicide by hanging by tying the ends of a common cotton pocket-handkerchief together and suspending it from the handle of his bedroom door, which was only two feet nine inches from the floor; he then sat down on the floor with his back to the door, put his head through the loop, and bent forwards. The sitting posture was proved by flattening of the nates—rigor mortis having set in before the body was discovered—and by the post-mortem stains on the lower part of the back and legs. The mark on the neck was an inch and a half broad, and extended from below the chin obliquely upwards and backwards over the occiput, the texture of the cloth being plainly impressed on the skin.

¹ *The Lancet*, 1889.

Nobiling¹ relates the case of a man, aged twenty-four, who also committed suicide by hanging with a pocket-handkerchief attached to the latch of a door, which was three feet seven inches from the floor. He adopted the kneeling posture, and was found dead with the knees bent and the toes touching the floor; the handkerchief was folded broadly, and left no mark behind.

The mere fact of a body being found only partly suspended would tend to remove a suspicion of homicide, since it is probable that a murderer in suspending his victim would be careful to make the suspension complete. As previously mentioned, the hands and feet have been found tied in cases of undoubted suicidal hanging, so that the finding of a body suspended, and with the hands and feet tied, is not necessarily presumptive of homicide, even if the position of the knot be such as to make it appear almost impossible that it could have been self-tied. This is illustrated by the following case described by Filippi, Severi, and Montalti,² a photograph of which was taken at the time, and is reproduced in Dixon Mann's 'Forensic Medicine.'³ The nude dead body of a man hanging by the neck was found in his office; the right foot touched the floor, the left was slightly lifted from it by flexion of the knee. The wrists were tied together behind the back in such a way that the knot of the cord was in front of them, and rested on the back of the body. It was exceedingly improbable that the knot could have been tied as found, behind the back of the individual, if tied by himself, and as every other indication pointed to suicide, the question arose, could he have tied them in front and then passed his legs between the arms? The possibility of this feat was subsequently tested by enlisting the services of a young acrobat, who, with considerable difficulty, succeeded in passing his legs between his arms, with the wrists tied together in front.

¹ *Aerztliches Intelligenzblatt. f. Baiern*, 1884.

² *Manuale di Med. Legale*, 1889.

³ *Lib. cit.*, p. 201.

TREATMENT OF THE APPARENTLY HANGED

After respiration has ceased, the heart, as a rule, continues to beat for a few minutes, and it is during this period that the opportunity for resuscitating the apparently hanged occurs. The person should be at once cut down, the ligature loosened, and the face and chest exposed to a current of fresh air; artificial respiration should be immediately resorted to, the face and chest being meanwhile flicked with a wet towel, and ammonia held under the nostrils; if there are signs of much cerebral congestion, venesection may be advisable. After recovery, convulsions and spasms of various kinds occasionally occur.

The following is an account of a remarkable case of the heart continuing to beat for a long time after death from judicial hanging; it is recorded by Tidy.¹ Drs. Clarke, Ellis, and Shaw, of Boston, were the observers, and the man who suffered judicial hanging, aged twenty-eight, and very vigorous, weighed 130 pounds. A drop of from seven to eight feet was given, and there was not the least perceptible struggle or convulsion, death probably occurring from syncope; the vertebral column was not injured. The heart was heard to beat one hundred times a minute for seven minutes after suspension; after nine minutes the beats were ninety-eight per minute; two minutes later the beats could not be heard. Twenty-five minutes after the drop fell, the man was cut down, but the rope was not untied. No impulse or sound of the heart was perceptible. The face was purple, and the pupils were dilated, but the tongue did not protrude, nor were the eyeballs prominent. The rope had been attached just above the thyroid cartilage. Forty minutes after the execution the ligature was relaxed, and also the ropes binding the arms; after this, the face and body gradually became pale. An hour and a half after the execution, a regular pulsation was observed in the right sub-clavian vein, and on applying the ear to the chest the heart

¹ *Legal Medicine*, part ii.

was heard beating eighty times per minute; only one sound was heard, regular and distinct, accompanied by a very slight impulse. The thorax was then opened, and the heart laid bare, but without stopping its movement; the right auricle contracted and dilated with energy and regularity. Half an hour later the pulsations of the heart were forty per minute, and an hour and three-quarters later they were only five per minute. Four hours and three-quarters after the time of the execution the spontaneous movements ceased.

STRANGULATION

Strangulation is that form of death from asphyxia in which the air-passage is occluded either by the constriction produced by a ligature around the neck, independently of suspension of the body, or by the employment of pressure with the fingers or otherwise on the larynx or trachea. Death results as a rule from the combined effects of asphyxia and of arrest of the cerebral circulation from compression of the great vessels of the neck. Sudden and violent compression of the windpipe by the hand probably produces unconsciousness sooner than if the constriction be made by a band. In some countries strangulation is the method employed for executing criminals; in Spain the customary method of execution is by the garrote, a steel collar tightened by a screw, the criminal being seated and fastened to a post. In Turkey and some other Eastern countries, strangulation by the bow-string is a common mode of execution.

When death from strangulation occurs from the use of a cord, the position of the ligature, as a rule, differs from that found in connection with death from hanging: in a case of strangulation the ligature is generally wound horizontally around the neck; in a case of hanging the position of the ligature is usually oblique. The distinction between death from strangulation and death from hanging is important, since the former is nearly always the result of homicide, while the

latter is generally due to suicide. The decision of the question as to whether death was caused by strangulation, or whether the ligature was placed round the neck after death from some other cause, must depend upon a careful observation of the appearances presented by the body at the necropsy.

Post-mortem appearances of death from strangulation.—

Any of the following conditions may be present, but they are not necessarily constant signs :—

I. The **face** is generally livid and swollen. The **eyes** are frequently wide open and prominent, and the pupils dilated. Ecchymoses may be present upon the face and eyes. The tongue may be swollen, dark-coloured, and somewhat protruded, and if great violence has been used to the neck, blood may have escaped from the mouth, nose, and even the ears; the escape of blood from the ears, however, is a rare occurrence, as it necessitates previous rupture of the tympanic membranes. None of these signs would be present if the constricting force had been applied to the neck after death; but, on the other hand, they cannot be depended upon as constant signs of death from strangulation. Swelling and lividity of the face and protrusion of the eyeballs may be present at the time of death, but may disappear after removal of the ligature or other constricting force. Protrusion of the eyeballs and tongue is more likely to occur in violent strangulation than in hanging; it should be remembered that, even after strangulation with violence, the face may be pale. Escape of urine and fæces, as in hanging, may occur.

II. The **mark on the neck** produced by strangulation takes, as a rule, a more horizontal direction, and encircles the neck more completely than that produced by hanging; the mark is frequently found on the level of or below the thyroid cartilage. If a cord has been used, the mark is apt to be less deep than in hanging, and subcutaneous extravasation is not always found. The parts beneath may, however, show considerable infiltration of blood, and if excessive violence has been used, fractures of the hyoid bone, or even of the thyroid cartilage,

may be found. If the hand has been used, as in throttling, the marks of the fingers may be found upon the front of the throat. The mucous membrane of the larynx and trachea is congested, of a purplish-red or violet colour, and is sometimes covered with a frothy, blood-stained mucus. This internal discolouration of the larynx and trachea should not be mistaken for the early signs of putrefaction of those organs (see i. p. 58). Cases have been recorded of death from strangulation without the occurrence of any mark round the neck; in these cases it is probable that the ligature was of a soft and yielding nature, that excessive force was not used, and that the ligature did not remain long around the neck. It should be borne in mind that the mark of the cord around the neck may certainly be produced on the dead body, if the attempt be made within a few hours of death. Casper found that a mark liable to be mistaken for that caused by vital strangulation could not be produced at a period of six hours after death.

III. The **lungs** may be found with some of the surface air-cells ruptured, and blood effused into their substance.

Accidental, homicidal, and suicidal strangulation.

Accidental strangulation.—This is a very rare mode of death, but a few cases have been recorded. Taylor and Stevenson record the two following cases. A girl was in the habit of carrying fish in a basket on her back, supported by a leathern strap passing above the shoulders round the front of her neck; she was found dead sitting on a stone wall, off which the basket probably slipped while she was resting, causing the strap to firmly compress the windpipe. The other case, which ended in recovery, was that of a boy, fourteen years of age, who while working in a factory was caught by a silk necktie in the band of an engine, by which means his neck was drawn down against one of the revolving shafts. The silk handkerchief being knotted and tightly twisted round his neck, his throat was firmly compressed for about one minute, after which the tie was cut. As a result of the strangulation he became extremely cyanosed, and blood escaped from his mouth and

ears. He was insensible for six or seven minutes after removal of the ligature, but eventually recovered.

Homicidal strangulation.—This is the most frequent variety of this form of violent death. Owing to the rapidity with which unconsciousness supervenes when the throat is suddenly constricted in strangulation, even a strong man may be unable to defend himself or to raise a cry for help. Homicidal strangulation can usually be recognised by the amount of violence employed, leaving marks upon the neck; either the mark of the ligature employed, or the marks of the fingers of the assailant, being frequently visible. Fractures of the thyroid or cricoid cartilages, or of the hyoid bone, though frequently absent in cases of homicidal strangulation, yet are occasionally present, and then are strongly presumptive of homicide. In addition, contusions and injuries of various parts of the body may indicate that a severe struggle took place. It is possible for a person to be strangled by the use of a soft and elastic ligature without any external marks of injury to the neck being visible. The Thugs, and other robbers met with in India, have in such a way destroyed their victims without external marks being left to indicate the mode of death. ‘Garrotte robberies’ are conducted by rendering the victim more or less helpless and incapable of crying for help, by the employment of partial or complete strangulation. The attack is generally made from behind; sudden constriction of the windpipe is effected either by seizure of it in the hands of the assailant, or by a ligature thrown around the neck and then suddenly tightened, while accomplices perpetrate the robbery.

It is to be remembered that the marks of homicidal strangulation have, in some cases, been detected some time after death or burial. In one case, the evidence of strangulation was obtained after thirty-eight days’ interment, the skin of the neck presenting a striking contrast to that of the rest of the body. The mark left by strangulation may even be visible after partial destruction of the body by burning. Taylor and Stevenson relate a case of suspected murder and incendiarism, in which

the burnt remains of the neck of a boy showed a horizontal mark or depression, encircling the greater part of the neck, about a quarter of an inch wide, and presenting a smooth surface, quite distinct from the broken, blistered, and carbonised skin above and below it; the tongue protruded from the mouth. From this condition of the neck and tongue, Schüppel, who examined the body, drew the conclusion that the boy had died from strangulation, and that the ligature had been applied to the neck while the boy was living, and had been burnt with the body.

Suicidal strangulation.—This is comparatively rare, except among the insane, with whom it is an occasional mode of self-destruction. The readiness with which the insane can obtain the materials for perpetrating the act explains its being occasionally resorted to by them; a handkerchief, a garter, a ribbon, or a strip of clothing will suffice for the purpose; the act is facilitated, moreover, by the rapid and insidious advent of unconsciousness, which prevents them from releasing the ligature or crying for help. Cases have been recorded which show that the necessary amount of constriction to produce strangulation can be effected by simply encircling the neck tightly once or twice with a ligature, and then tying it, or even without tying.

Signs of anything like severe local or general violence are absent in cases of suicidal strangulation. There may be a few scratches about the neck, and some slight extravasations of blood into the tissues underlying or in the vicinity of the mark of the cord, but fractures of the cartilages or of the hyoid bone and rupture of the muscles are absent in cases of suicidal strangulation. Taylor and Stevenson relate a case, in which a man was found dead in bed, with his handkerchief tied round his neck, and twisted from right to left by means of a razor-strop; there was no doubt that it was a case of suicidal strangulation. A case has recently been reported¹ in which a middle-aged female committed suicide by strangulation. She was a servant, and was found one morning in the nursery, two

¹ *Brit. Med. Jour.*, 1893.

doors locked on the inside having to be forced open before the body was discovered. The deceased was found lying on the floor face downwards, with her hands beneath her. There was blood oozing from her mouth. List was bound round her throat, and tape was over the list; there were two yards of list and three yards of tape, not tied at all, but simply wound evenly round the throat below the cricoid, layer upon layer. The tip of the tongue was protruding from the mouth. The windows were shut and fastened on the inside of both rooms. There was reason to think that the deceased might have been the victim of religious mania.

Strangulation by throttling.—This is strangulation effected with the unaided hands. Experiments made on the dead body demonstrate the ease with which the air-passage can be occluded by pressure on either side of the thyroid cartilage; only slight pressure is required to close the aperture between the vocal cords, while stronger pressure causes them to overlap. Strong pressure between the larynx and hyoid bone also occludes the air-passage, mainly by the approximation of the ary-epiglottic ligaments.

Throttling, as a rule, leaves fairly well-marked external and internal signs of the violence employed. **Externally** marks are usually found on both sides of the front of the throat, sometimes situated as far back as the angle of the lower jaw. The marks are sometimes separated, and show the impressions made by the separate fingers of the assailant, or they may be so closely grouped together as to prevent separate recognition of the individual finger-marks. The outline of the marks is generally irregular from extravasation of blood, but occasionally the marks may correspond with the shape of finger-tips, and separate concentric marks or depressions may represent the impressions made by the finger-nails of the assailant. If there has been a severe struggle, the skin of the throat may be scratched or excoriated. Careful examination should be made to see if there be one mark (corresponding to the impression of the thumb) on one side of the throat, and several

marks, separate or grouped (corresponding to the impressions of the fingers) on the other side; from this examination the fact may be ascertained as to whether the right or left hand of the assailant was used to throttle the victim, or as to whether both hands were employed. If the marks are examined soon after death, they present the appearances of bruises, but if the examination be deferred for some time, they may present a horny or parchment-like appearance. **Internally** blood is usually found extravasated in the soft tissues beneath the marks; fractures of the thyroid and cricoid cartilages and of the hyoid bone are frequently met with. Wounds of the tongue and cheeks may be found from their being caught between the teeth.

Taylor and Stevenson relate a case of homicidal strangulation in which the following appearances were noted. The victim was a woman whose death had been caused by throttling. 'There was a bruise, with extravasation of blood, immediately beneath the lobule of the left ear; and another, also with extravasation, three-quarters of an inch below the lobule of the right ear. Corresponding to this latter bruise, a second effusion of blood had taken place into the deeper tissues half an inch beneath the surface. There were other bruises over each eyebrow, at the back of the right wrist, over the knuckle of the left little finger, at the inner side of the left elbow, and at each angle of the mouth. Within the mouth was a contused and lacerated wound opposite the jagged stump of a canine tooth, and, exactly opposite to this, on the upper lip was a smaller bruise, with extravasation of blood. The tongue was bruised on the right side, as though it had been caught between the teeth. The left lateral upper incisor was loosened, and the tongue and effused blood showed that the wound was recent. The blood generally was dark and fluid. The brain and its membranes were intensely congested. There were no marks of injury to the throat. The lungs were congested, and emphysematous on the surface. The heart contained a quantity of dark fluid blood. Urine and fæces had escaped.'

Although throttling may be regarded practically as a homi-

cidal act, yet one case of suicidal throttling has been recorded by Binner.¹ A woman, aged forty, suffering from melancholia, who had previously made several attempts upon her life, was found dead in bed, in a crouched position, with both hands compressing the throat; the elbows were supported on the knees, and the back was leaning against the wall; there were marks of her finger nails on both sides of the throat, and death had resulted from compression of the throat by the fingers.

SUFFOCATION

Suffocation is that form of death from asphyxia in which air is prevented from entering the lungs, not by constriction of the larynx or trachea, nor by submersion in water, but by some mechanical cause, which may operate in one of the three following ways:—(i) externally, by blocking the mouth and nostrils; (ii) internally, by blocking the throat, larynx, or trachea; and (iii) mechanical pressure on the thorax, such as occurs in great crowds of people.

Suffocation, therefore, differs from the other modes of death from asphyxia, in that it may be caused by diseased or morbid conditions apart from external agency. An adult person, if deprived of air by covering the mouth and nostrils, generally dies in from four to five minutes. Experiments made on dogs by suffocating them show that in their case the average duration of the respiratory movements, after the animal has been completely deprived of air, is four minutes and five seconds; the average duration of the heart's action is seven minutes and eleven seconds.

Various modes of death by suffocation.—I. Smothering, by covering the mouth and nostrils with some soft material or with the hand, or by compressing the mouth and nose so as to exclude air.

II. The accidental or forcible introduction of foreign bodies into the mouth and throat.

¹ *Zeitschr. f. med. Beamte*, 1888.

III. The plunging of the face into such substances as dust, snow, mud, feathers, leaves, &c.; this form of death is actually a combination of the two former modes of death by suffocation.

IV. Closure of the opening between the vocal cords from œdema or spasm of the glottis, or from accumulation of the products of exudation (as may occur in connection with membranous croup and diphtheria).

V. Obstruction of the trachea either with blood from a wound in the throat or from the bursting of an aneurism, or with pus from the bursting of a pharyngeal abscess.

VI. Obstruction of the lower portion of the trachea in a case of cut-throat, owing to retraction of the lower end and covering by the soft parts.

VII. Mechanical pressure on the thorax, such as from a person kneeling on the chest, or by the application of weights to the chest, or by pressure such as may occur in great crowds of people.

Smothering.—This is a very common mode of destroying new-born children; it is easily accomplished, no characteristic signs are left, and death, in such cases, is frequently attributed to convulsions. Smothering is the most frequent cause of violent death among infants, and *overlaying* is the commonest way in which such infants meet with death. Overlaying is caused by some part of the person of the parent, or other individual sleeping in the same bed as the infant, covering the mouth and nostrils of the child so as to produce suffocation. An infant may also be easily suffocated by the bed-clothes accidentally covering the mouth and nostrils. Many cases of overlaying, no doubt occur from the mother being in an intoxicated condition, when she is less likely to be aware of her dangerous proximity to the child, and when the infant may probably have been previously stupefied with alcohol conveyed to it in the mother's milk. In some cases it is to be feared that the temptation of burial-club money is responsible for violent death by smothering. It is possible for an adult to be accidentally smothered in bed; a man was found dead in bed,

lying with his face downwards and one arm under his head. The medical evidence showed that the cause of death was suffocation, by reason of the deceased having turned with his face to the pillow, and so covered his mouth and nostrils.

Amongst other causes of accidental smothering may be mentioned mere continued pressure of the child's face against the mother's breast in the act of suckling, and the seizure of epileptics with fits when in bed, the face becoming buried in the bed-clothes or bedding. Homicidal suffocation by smothering is, as a rule, only resorted to in the cases of infants and young children, and occasionally in old and infirm adults. Suicidal smothering is almost unknown.

The accidental introduction of foreign bodies into the mouth and throat leading to suffocation occasionally occurs from the attempt to swallow too large a bolus or mass of food, or during the act of vomiting from a sudden inspiratory effort drawing some of the vomit into the larynx or air-tubes. In some cases of death from either of these causes, the fatal event may occur with great rapidity, especially if the individual be advanced in years; in such sudden cases, there may be no signs whatever of death from asphyxia revealed at the post-mortem examination, death probably having been due to syncope.

Suicidal suffocation from the forcible introduction of foreign bodies into the mouth and throat is practically limited to the insane. In one instance, a young woman committed suicide by thrusting a ball of hay into the pharynx behind the larynx, it being just visible when the mouth was widely opened. In another case, a woman was found suffocated in bed with part of a stocking protruding from her mouth; the portion within the mouth and pharynx was removed with great difficulty. Sankey¹ describes the case of a male epileptic who committed suicide in an asylum, and was found dead, lying on his back in bed with a round pebble in each nostril, and a strip of flannel rolled up and stuffed into the throat.

¹ *Brit. Med. Jour.*, 1883.

Homicidal suffocation from the forcible introduction of foreign bodies into the mouth and throat is seldom met with, except in infants and young children. In the case of children various substances—such as pieces of cloth, pieces of paper, sand, earth, and artificial teats—have been found in the mouth and pharynx. The following case is peculiar. In 1889 a man was convicted of the murder of a woman (*Reg. v. Kerr*, Carlisle Sum. Ass., 1889). It appeared that the woman died whilst, or shortly after, a rape was committed on her by the prisoner, accompanied by brutal violence. The actual cause of death was suffocation brought about by the vomiting of a hearty meal. A case reported by Littlejohn illustrates the necessity of care in distinguishing homicidal from accidental suffocation. While examining the body of a woman who was stated to have died suddenly, he found a quart-bottle cork firmly fixed in the upper part of the larynx. *The sealed end of the cork was uppermost*, and it had the marks of a corkscrew on it. Fractures of the ribs were found, and it was evident that the deceased had not died a natural death; the epiglottis, trachea, and larynx were considerably injected. It was suggested, at the trial, that the deceased, while extracting the cork from the bottle with her teeth, had, by the sudden impetus of the liquid issuing from the bottle, drawn it into the position in which it was found. This view was negatived by the fact that the sealed end of the cork was uppermost, and also by the marks of the corkscrew. The medical opinion was that the cork had been forcibly pushed into the larynx, while the woman was in a helpless state of intoxication. Although there was no reason for doubting that this was a deliberate act of murder, yet the person on whom the strongest suspicion fell was acquitted on the Scotch verdict of 'Not proven.'

Taylor and Stevenson point out a dangerous practice common among ignorant nurses, which, without exciting suspicion on the part of a coroner or medical witness, may be an occasional cause of death in infants. In order to quiet a child, and to enable a nurse to sleep without disturbance, a bag made of

wash-leather or rag, containing sugar, is thrust into the child's mouth. It is thus completely gagged, and the child soon becomes quiet, respiring chiefly through the nostrils. If these by any accident become obstructed, or if, by the act of inspiration, the bag should fall to the back of the throat, death from suffocation results, the infant being helpless. The suspension of breathing may be so gradual that the child may die without crying or without the occurrence of convulsions. The removal of the bag from the mouth, as no violence has been used, will remove every trace of the cause of death; and, in order to exculpate herself, the guilty person may ascribe death to 'fits.'

Post-mortem appearances of death from suffocation.—There may or may not be any of the signs indicative of death from asphyxia (see p. 106), so that the absence of the so-called signs of death from asphyxia does not exclude the possibility of death having resulted from suffocation. The real cause of death may not be detected unless the air-passages from the mouth down to the bronchi are systematically examined, a procedure which should always be observed at post-mortem examinations made for medico-legal purposes. External signs of general violence, such as bruises, scratches, &c., should be carefully looked for. Homicidal suffocation, however, may leave behind it no characteristic evidence. The sub-pleural ecchymoses, first mentioned by Tardieu, are of no diagnostic value, as they may occur in death from other forms of asphyxia, or from pathological states, and they are not, by any means, always present in cases of death from suffocation. If death has taken place quickly, there may be no congested condition of the lungs, nor any engorgement of the right side of the heart. Doubtless many cases of death from suffocation have been attributed to convulsions.

In 1883 a terrible catastrophe occurred in Sunderland by which about 200 children met with their death from suffocation by compression of the chest. A panic occurred in the gallery of a public hall which was occupied by some hundreds of children, who, in rushing downstairs, were arrested by a closed door. A block occurred at the bottom of the steps, and about

300 children became piled up so as to form an inextricable mass about seven or eight feet high. Many of the bodies were examined by Lambert,¹ who found in nearly all the cases the following post-mortem appearances: congested puffy face, swollen vessels of the neck, eyelids closed, protruding eyeballs, extremely dilated pupils, and froth about the mouth and nostrils. In the great majority of cases urine and fæces had been expelled. Cadaveric rigidity was absent. In twenty-four hours most of the abnormal appearances of the faces had passed away; they then presented the appearance of peaceful repose.

¹ *Brit. Med. Jour.*, 1883.

QUESTIONS CONNECTED WITH THE ORGANS OF GENERATION

CHAPTER XXXIII

Pregnancy—Signs of pregnancy in the living—Signs of pregnancy in the dead - Appearances of the fœtus at various months—Precocious pregnancy—Late pregnancy—Unconscious pregnancy.

PREGNANCY

IN connection with this subject, the following questions, as being of medico-legal importance, will be discussed :—The signs of pregnancy in the living and dead ; the signs of recent delivery in the living and dead ; the indications of remote pregnancy or delivery ; the time that must elapse after delivery before conception can again occur.

A medical man may be required to ascertain the existence or non-existence of pregnancy under any of the following circumstances :—(i) When a woman condemned to death pleads pregnancy to stay execution. In such a case the old proceeding, which is now gradually dying out, was to empanel a jury of twelve matrons, who examined the woman, and then made their report to the judge. It is customary now to delegate this duty to one or more medical men. If the condemned woman is found to be pregnant, the carrying out of the execution is postponed till after her delivery. (ii) When a woman asserts, after the death of her husband, that she is pregnant with an heir to an estate. In such a case the heir-at-law to the estate may claim a right to have her statement verified, in order to

prevent the fraudulent substitution of the child of another person. (iii) When a girl, who has been seduced, asserts that she is pregnant as a plea for increased damages. (iv) When an accusation of pregnancy, which may be a libellous one, is made against a single woman, or a widow, or a married woman living apart from her husband. (v) When a woman, claiming compensation on account of the death of her husband from negligence, asserts herself pregnant as a plea for increased damages from those supposed to be liable for the neglect which caused his death.

It should be carefully borne in mind that the examination of a woman, whether to ascertain the existence of pregnancy, or in cases of alleged concealment of birth, infanticide, or abortion, cannot be made without her free consent; she should also be cautioned, previous to giving such consent, that the evidence obtained by the examination may be used against her. This is only just, as the law does not force anyone to furnish evidence against himself or herself. Mr. Justice Lopes, in the case of *Agnew v. Jobson*, clearly laid it down that 'neither magistrates, nor policemen, nor medical men may infringe on the rights of any person.' The issuing of an order for the examination of a woman without consent is illegal, and will not prevent the punishment of a medical man who acts upon the order, unless he first obtains the free consent of the female to the examination. A medical practitioner who carries out such an order without obtaining consent is guilty of an indecent assault, and is liable to be punished accordingly; or he may incur heavy penalties by a civil action for damages being instituted and carried against him. In the case of a magistrate issuing such an order, and a medical practitioner carrying it out, without the consent of the woman, both parties are liable to prosecution. In one case damages amounting to 50*l.* were obtained from a magistrate who had given a written order for the examination of a female charged with concealment of birth, and from the physician and surgeon who obeyed it. Moreover, non-resistance on the part of the female is not to be taken

as either consent or compliance. The rule which all medical men should follow is : never to make an examination of a female for medico-legal purposes without previously cautioning her, and without obtaining her free consent to the examination, given in presence of a third person.

SIGNS OF PREGNANCY IN THE LIVING

I. Suppression of the catamenia.—This occurs, in the majority of cases, as soon as conception has taken place. If taken in conjunction with other signs, it possesses decided value, but alone it is a sign of but little importance, since suppression of the menses frequently occurs apart from pregnancy, and, moreover, in some exceptional cases, the monthly discharge continues throughout the entire period of pregnancy. Many constitutional disorders, irrespective of pregnancy, may cause suppression of the menses. Moreover, it should be remembered that the continuance of the menstrual discharge is not a necessary condition for impregnation. Several cases have been recorded in which women have become pregnant notwithstanding a long previous cessation of the discharge. On the other hand, as previously mentioned, exceptional cases occur in which a discharge of blood occurs either for several periods in a pregnant woman, or during the whole course of pregnancy. The continuance of the menses during the early months of pregnancy, followed by its cessation later on, may make a pregnancy appear short. Exceptional cases have occurred where, on the one hand, women in whom menstruation has never taken place have given birth to children, and, on the other hand, where a menstrual discharge has appeared only during pregnancy, and has been absent at other times. When hæmorrhage does occur during pregnancy, it is generally irregular in type, and in the majority of cases has no analogy to the menstrual loss seen in the non-gravid state.

Occasionally menstruation is feigned, the woman staining her linen with blood. There are no certain chemical means of

distinguishing between menstrual and ordinary blood, although there are a few differences between them.

II. **Morning sickness.**—This is a reflex phenomenon. It commonly commences from the second to the sixth week after conception, and diminishes or ceases, as a rule, about the fourth month, or after quickening. It is altogether an uncertain and unreliable sign of pregnancy.

III. **Changes in the breasts.**—These changes usually commence with pregnancy, and become clearly perceptible at the end of six weeks or two months. The breasts enlarge and become firmer, heavier, and more knotty; the veins on the surface become marked and prominent; the areolæ around the nipples become darker in colour and wider. Around the margin of the areola a number of elevated nodules form, indicating the presence of active sebaceous glands. Later on, secondary areolæ may form, dotted over with small light-coloured spots. Pigmentation of the areola is not unfrequently observed in non-pregnant women; in brunettes it may be of a brown or almost black colour, and in fair women of a pink colour. Changes in the areola are not of much value for the purposes of diagnosis, except in those who are pregnant for the first time. If the breasts are gently squeezed, a clear serous or milky fluid exudes from the nipple. The presence of milk in the mammary gland, however, is no proof of pregnancy, since it is occasionally seen in the unimpregnated female, and even in young girls; moreover, it may be produced as the result of uterine or ovarian disease, or by other causes acting reflexly. A case has been recorded¹ of a woman, aged fifty-five years, whose catamenia had ceased, and who undertook to bring up the child of a deceased friend. To keep it quiet at night, she was accustomed to put it to the breast. In six months the secretion of milk was perfectly established, and she continued to nurse it for twelve months, the child becoming healthy and strong. Cases have even been recorded of the secretion of milk in the breasts of males.

¹ Wharton and Stillé's *Med. Jurispr.*, vol. ii.

IV. **Abdominal symptoms.**—In pregnancy, the enlargement of the abdomen begins to be obvious after the end of the third month, when the uterus rises out of the cavity of the pelvis. Towards the end of the fourth month the uterus reaches about two inches above the symphysis pubis. About the fifth month it is midway between the pelvis and umbilicus, and about the sixth month it is on a level with the umbilicus. At the seventh month it is about two inches above the umbilicus, and at the end of the eighth month it is immediately below the ensiform cartilage. During the latter part of the ninth month the uterus generally sinks slightly, owing to the relaxation of the soft parts. The height to which the fundus of the uterus reaches at different months is, however, subject to considerable variation. Enlargement of the abdomen may proceed from many other causes than pregnancy; it may be due to excess of fat, ascites, flatus of the intestines, impacted fæces, ovarian tumour, retained menses, distension of the bladder, and enlargement of the spleen, liver, or kidney. In some cases, movements which may simulate those of a child may be traced to flatus in the intestines, accompanied by contraction of the abdominal muscles, constituting what is known as a *phantom tumour*; such an enlargement subsides when the woman is placed under an anæsthetic.

The **skin** of the abdomen is stretched, and the **umbilicus** is almost obliterated as pregnancy advances. As the result of stretching numerous wavy lines appear, which are situated in the region below the umbilicus. They are to be seen about the sixth month of pregnancy, and become more marked as the pregnancy advances. They are violet or reddish-blue in colour, and become white after delivery. They are absent in about ten per cent. of cases. The disappearance of the umbilical depression becomes complete about the seventh month. A **brown pigment line** generally extends from the pubes to the umbilicus, and forms an areola around the latter. Such a line may also be produced by uterine or ovarian disease.

The **uterus** may be felt to **contract** and **relax** when the cold

hand is laid upon the abdominal wall, the contractions taking place about every five or ten minutes. The **movements of the child** within the uterus may be felt. These movements should not be confounded with intestinal movements due to the escape of flatus from one portion of the bowels into another, or with irregular local contractions of the mother's abdominal muscles. Cases frequently occur in which the movements of the child are scarcely perceptible.

V. Changes in the uterus.—A gradual **enlargement** of the uterus takes place. The **cervix** becomes apparently shortened, from general swelling of the surrounding parts. The consistency of the cervix also alters. Previous to pregnancy it is usually hard, communicating to the finger somewhat the impression of touching the nose; whereas during pregnancy it is generally softer, feeling somewhat like the mucous side of the lips. This softening extends from below upwards, until it involves the whole cervix. It occurs more rapidly in multiparous than in primiparous women. The **os** is rather patulous, and possesses a puckered boundary.

VI. Symptoms due to the contents of the uterus.—From the fourth to the fifth month of pregnancy, the subjective symptom of **quickening** is generally experienced. It is due to the movements of the fœtus being felt by the mother as the uterus rises out of the pelvis. The sign is purely subjective, and is an extremely uncertain indication of pregnancy. Women have been known to mistake other sensations for it; moreover, a woman may declare that she has felt quickening when she has not.

After the fifth month of pregnancy the **sounds of the fœtal heart** can generally be heard, and constitute a sure sign of pregnancy. The pulsations are not synchronous with those of the arteries of the mother, being much more rapid. The frequency of the beats of the fœtal heart is in inverse ratio to the state of gestation, being about 160 per minute at the fifth month and 120 at the ninth month. They are usually best heard by applying the stethoscope to the abdominal wall of the

mother at a point midway between the umbilicus and the anterior superior spine of the ilium on the left side. This position is usually the best, owing to the foetal heart-sounds being conducted best through the back of the child, and being, therefore, most audible where this is in contact with the anterior wall of the uterus. As the foetus most frequently lies with the occiput over the brim of the pelvis, and its back towards the left side of the mother, the sounds of the foetal heart are usually best heard at the spot indicated. The sounds may be heard at times, and at other times may be inaudible, owing to a change in the position of the child.

The **uterine souffle** is a peculiar blowing or whistling sound, synchronous with the maternal pulse. It is probably due to the passage of blood through the uterine arteries, and may be heard all over the uterus. It may be perceived as early as the third month. It is not a certain sign of pregnancy, as it may be heard in enlargements of the uterus from other causes, such as tumours.

Ballottement.—To obtain this test, the woman is placed in the semi-recumbent position, in order to bring the vertical diameter of the uterine cavity into correspondence with that of the pelvis. Two fingers of one hand of the operator are introduced per vaginam to the front of the cervix, the other hand being placed upon the abdominal wall to steady the uterus. A sudden upward jerk is then given to the uterine walls by the fingers within the vagina, when a hard body (the head or breech of the foetus) is felt first receding from and then falling back on the part of the uterine walls in contact with the tips of the fingers.

VII. Changes in the vagina.—During pregnancy the mucous membrane of the vagina becomes congested, and assumes a violet or cyanotic hue. This indication is of but little value.

The so-called *kiestein test* of the urine is absolutely valueless as a proof of pregnancy.

Certain signs of pregnancy.—The subjective signs mentioned above are of but little value to the medical jurist, as his diagnosis

of the existence or not of pregnancy should be made independently of and apart from statements made by the woman, since the latter must be regarded by him as an unfriendly witness. It is generally her object to impress the medical man who is examining her with the idea that either she is pregnant or that she is not, and since the various subjective signs, even in the case of a perfectly truthful witness, may be misconceptions or errors of judgment, no reliance should be placed upon them by the medical jurist. Many of the signs, subjective and objective, enumerated above, are suggestive of the existence of pregnancy, but are not conclusive signs. The only **certain signs of pregnancy** are the **sounds of the foetal heart** and the **presence and movements of the foetal limbs**. If the child be dead, then the recognition of the foetal limbs is the only positive sign of pregnancy.

As none of the certain signs of pregnancy are available until the fifth month, it is not possible, prior to this period, for the medical jurist to make a statement on oath as to the existence or not of pregnancy. Even after this period has elapsed, a negative result upon examination does not afford proof that the woman is not pregnant. In legal cases, where proof of pregnancy or not is required, a postponement of the case is made, when necessary, in order to allow the lapse of sufficient time to obtain certain evidence.

FURTHER SIGNS OF PREGNANCY REVEALED AT A POST-MORTEM EXAMINATION

I. **The presence of an ovum or foetus.**—The unimpregnated uterus resists putrefaction longer than any other soft organ. Casper mentions the case of a young woman whose body was found, nine months after her disappearance, in the soil of a privy, and so decomposed that the bones separated from the soft parts. The uterus was of a reddish colour, hard to the touch, and firm when cut into. On examination, it proved to be in the unimpregnated state, a fact of medico-legal im-

portance, as it was alleged that the deceased was pregnant by a young man, who was suspected of murdering her in order to conceal her condition.

Appearances of the fœtus at various stages of its growth.
First month.—The fœtus is a semi-transparent mass, measuring from one-twelfth to one-third of an inch in length, if the measurement be taken in a straight line. *Second month.*—It is curved upon itself, weighs about sixty grains, and measures from one-half to two-thirds of an inch in length. The head and extremities can be made out, the latter being in the form of rudimentary projections from the body. The eyes can be seen as small black spots on the side of the head. *Third month.*—The fœtus weighs about an ounce, and when stretched out measures about three inches. The first traces of the fingers can be made out at this period. *Fourth month.*—The weight is about four ounces, and the length about six inches. The sex of the child can now be ascertained on inspection. *Fifth month.*—The weight is about ten ounces, and the length about nine inches. The head constitutes about one-third of the length of the entire fœtus, and hair can generally be seen on the head at this stage. *Sixth month.*—The weight is about one pound, and the length from ten to twelve inches. The eyelids are closed, and the membrana pupillaris exists. *Seventh month.*—The weight is from three to four pounds, and the length from thirteen to fifteen inches. The eyelids are open. *Eighth month.*—The weight is from four to five pounds, and the length from sixteen to eighteen inches. The nails are completely developed. *Ninth month.*—The fœtus weighs at the completion of pregnancy about six and a half pounds, on an average, and measures about twenty inches in length.

Abnormal products of conception.—The ovum or fœtus may be replaced by certain abnormal products of conception, which it is important should be distinguished from diseased conditions of the uterus occurring independently of impregnation. These abnormal products of conception are called *moles*, and are of two kinds—the *sanguineous* or *fleshy mole*, and the *vesicular mole*.

The *sanguineous* or *fleshy mole* is the result of hæmorrhage into the foetal membranes, the effusion of blood being insufficient to effect the entire separation and expulsion of the ovum, but causing the ovum or foetus to perish in consequence of pressure. The foetus either entirely disappears from becoming dissolved in the liquor amnii, or it becomes macerated, shrivelled, and greatly altered in appearance. The effused blood ultimately becomes decolourised from absorption of the colouring matter or of the red corpuscles. If such a mole be retained in the uterus for long, calcareous deposits may occur in it. Careful microscopic examination generally enables the villi of the chorion to be seen. The sanguineous mole is rarely larger than an orange. If twin conception has taken place, a mole may exist along with a foetus which undergoes normal development. A fleshy mole may be retained till the sixth month, or even later. The expulsion at the end of that time of a mole the size of an ovum at two months' gestation may lead to misconception, if the husband has been away for several months.

The *vesicular mole* is due to vesicular degeneration of the villi of the chorion. This mole consists of a number of translucent vesicles, containing a clear limpid fluid; the vesicles vary in size from that of a millet-seed to that of an acorn. If the degeneration has commenced at an early period of pregnancy, all traces of the embryo may ultimately disappear; if it commences at a later period, some remains of the foetus may be found. The vesicular mole is also variously described as *uterine hydatids*, *hydatiform degeneration of the chorion*, and *cystic disease of the ovum*. The two former names are unfortunate, since, by their use, the condition is liable to be confounded with that of true hydatid (*echinococcus*) disease, which is independent of impregnation, whereas the vesicular mole can only occur as the result of conception. The true hydatid is very rarely found in the uterus.

II. The presence of a so-called true '*corpus luteum*.'—The value of the corpus luteum as a sign of pregnancy is much diminished by the fact that a similar body develops in the

ovary after each discharge of a ripened ovum in connection with the menstrual flow. The latter is usually termed a *false corpus luteum*, because it generally differs in some particulars, such as size and appearance, from the '*true corpus luteum*' of pregnancy. The one may, however, assume all the characters of the other under the influence of some reflex excitement from the uterus or other pelvic organs. The presence, therefore, of the so-called '*true corpus luteum*' can only be regarded as presumptive, not absolute, evidence of pregnancy having occurred. Moreover, the value of this so-called sign is still further lessened by the fact that a corpus luteum has been found where there was neither pregnancy nor menstruation. Tidy¹ mentions two cases illustrative of this—one, the case of a prostitute, aged twenty-one, who died from prussic acid poisoning, and who, at the time of death, was neither pregnant nor menstruating; a fully ripe corpus luteum was found in one of the ovaries, prostitution being probably the cause of the increased nutrition and development of the follicle. Another was the case of a woman, aged forty-one, who died from gangrene of a uterine fibro-myoma; the ovary was found to contain a corpus luteum resembling in all respects that met with in pregnancy. In this latter case, it is quite possible that the abnormal development of the corpus luteum was due to the increased determination of blood to the parts in consequence of the uterine fibroid.

PRECOCIOUS PREGNANCY

Many instances of precocious pregnancy have occurred, not only in tropical, but also occasionally in temperate climates. The earliest recorded period of pregnancy is that of a case given by Lefebvre,² in which a girl born with hair on the pubes, and who menstruated when four years old, became pregnant at the age of eight by a man aged thirty-seven, who

¹ *Leg. Med.*, vol. ii.

² *Gaz. Hebdom.*, 1868.

was afterwards sentenced to five years' imprisonment for the seduction. The pregnancy terminated in the expulsion of a mole containing a well-characterised human embryo.

The earliest recorded age of maternity in this country is reported by Dodd.¹ A girl began to menstruate at the age of twelve months, became pregnant when eight years and ten months old, and was delivered of a living child, weighing seven pounds, just 147 days before she had reached the age of ten years. There can be no doubt as to the exact age of this young mother, as Dodd had himself attended at her birth less than ten years previously, and afterwards delivered her of a healthy child at this remarkably early age. Wharton and Stillé² mention a somewhat similar instance, where menstruation commenced in the first year, pregnancy in the ninth, and the child at birth weighed seven and three-quarter pounds. Curtis³ records a case in which a girl became pregnant (by a boy of fifteen) twenty-four days before she was ten years old; she was delivered at the age of ten years, eight months, and seven days of a healthy child at full term. Allen⁴ reports a case in which a girl commenced to menstruate at eleven years of age, became pregnant (by a boy of fourteen), and at the age of thirteen and a half years gave birth to a fine healthy boy weighing nine pounds. Dobson⁵ reports a similar case, where a girl began to menstruate when eleven years old; she became pregnant at twelve years and nine months, and gave birth to a male child at the age of thirteen and a half. All these cases indicate that the presence of puberty must be determined by the sexual development of the individual rather than by the age.

LATE PREGNANCY

Women generally do not bear children after about forty-five years of age, nor, as a rule, after the menopause. Exceptional

¹ *The Lancet*, 1881.

² *Med. Jurispr.*, vol. ii.

³ *Boston Med. and Surg. Jour.*, 1863.

⁴ *Brit. Med. Jour.*, 1885.

⁵ *Ibid.*, 1884.

cases, however, have been met with of maternity occurring later in life than forty-five years of age, and after the occurrence of the menopause, showing that the procreative powers do not necessarily cease at that epoch. Underhill¹ delivered a woman in her forty-ninth year who had not menstruated for two years. Lavasseur² records the case of a woman, aged fifty, who had ceased to menstruate for two years, and who gave birth to a living child at full term. Davis³ relates the case of a woman, aged fifty-five years, who was delivered of a child; the statement of age was verified by reference to the baptismal certificate of the woman. Depasse⁴ records the case of a woman, aged fifty-nine years, who was delivered of a healthy child, which she suckled and weaned on her sixtieth birthday; this woman at the time of her confinement had a daughter forty years old. Reese⁵ mentions the case of a woman who had twins at sixty-four years of age.

UNCONSCIOUS PREGNANCY

A woman can certainly become pregnant unconsciously, since cases have occurred in which women have been raped while in an unconscious state from the action of narcotic drugs, or from the inhalation of chloroform or ether vapour, and pregnancy has been known to result from such intercourse. Intercourse has also taken place during profound sleep, without the woman being aware of it. It is, however, very improbable that a woman should go beyond the sixth month of pregnancy without being aware of her condition. It is almost incredible that an unmarried female, not feeble-minded or idiotic, should be unconscious both of the fact of sexual intercourse, and of the resulting pregnancy up to the birth of the child. Such a statement must certainly be received as highly improbable. That it is quite possible for

¹ *American Jour. of Obstet.*, 1879.

² *Gaz. de Gynéc.*, 1891.

³ *Lond. Med. Gaz.*, 1847.

⁴ *Gaz. de Gynéc.*, 1891.

⁵ *Med. Jurispr.*, p. 488.

married women to become pregnant without being aware of it is illustrated by the following cases related by Taylor and Stevenson :—‘ Long met with a case in which a married woman, aged twenty-four, subject to irregular menstruation, consulted him for an attack of spasms. On his arrival, he found that she had suddenly given birth to a seven-months’ child. Neither she nor her husband had the slightest idea that she was pregnant. A married lady, who had not had a child for a period of nineteen years, found herself, as she thought, getting unusually stout. She was moving about with her family to different places. At last her size alarmed her, and she thought she was suffering from dropsy ; she consulted a physician, who informed her that she was in an advanced state of pregnancy. She treated this opinion with great contempt. While travelling with her daughter, she was seized one night, at an inn, with the pains of labour, and was delivered of a child. She had made no preparation for the birth, and, up to the moment when she was seized with labour pains, she had not, with all her former experience, the slightest idea that she was pregnant.’

CHAPTER XXXIV

Delivery—Signs of recent delivery in the living—Signs of delivery in the dead—Unconscious delivery.

THE question as to whether a woman may have been recently delivered or not more frequently falls within the province of the medical jurist than the determination of the existence of pregnancy. Concealment of birth, infanticide, abortion, and questions relative to supposititious children are closely dependent on the proof of delivery.

The concealment of pregnancy is no offence in the English law, although the Scotch law punishes women for the concealment of pregnancy, if the child be dead or missing; but the concealment of delivery or of the birth of the child is by English law a misdemeanour. The words of the Act (24 & 25 Vict.) are as follows:—‘If any woman shall be delivered of a child, every person who shall by any secret disposition of the dead body of the said child, whether such child died before, at, or after its birth, endeavour to conceal the birth thereof, shall be guilty of a misdemeanour.’ Women tried under this statute are actually punished, not for concealment of birth, but for concealment of the body; upon this term **concealment** a very strict interpretation is placed—there must be a ‘secret disposition’ of the dead body.

SIGNS OF RECENT DELIVERY IN THE LIVING

These signs necessarily vary very much according to the period of pregnancy at which delivery took place, and the time that has elapsed since the delivery. The following signs are

those indicative of recent delivery at full term; the signs present at other periods being simply a question of difference of degree.

1. **Facial expression.**—The woman appears to be weak, and shows signs of general indisposition and languor; the countenance is pale, and there are dark areolæ around the eyes.

2. **Breasts.**—These are full; the nipples are enlarged and are surrounded by pigmented areolæ. Milk can generally be squeezed from the nipples. The superficial veins are evident.

3. **Abdomen.**—The walls are flaccid; the skin is relaxed, and sometimes disposed in folds, with superficial streaks of a light-brown colour. A dark line extends from the pubes to the umbilicus. Through the abdominal walls the uterus may be felt, generally lying to one or other side, and reaching as far as the navel, or nearly so; unless it is felt during an actual contraction, it possesses only a moderately firm consistence, and in size is equal to the foetal head.

4. **Vulva and vagina.**—These parts are swollen, contused, and sometimes lacerated. The outlet is much dilated, and the posterior commissure is usually ruptured, the perineum being sometimes torn as well. The os externum and lower part of the cervical canal are patulous and readily admit the forefinger; the os internum is usually closed. On bimanual examination the uterus is found to be enlarged. By means of the speculum the external os is seen patulous, and the margins are fissured or torn; the use of the uterine sound shows that there is an increased depth to the cavity of the uterus.

5. **Presence of the lochia.**—The lochial discharge is variable both as regards its amount and duration; generally it lasts from about a week to a fortnight. At first it is of a red colour, then changes to brown, and finally assumes a greenish tint. The lochia at first consist of almost pure blood, containing mucus, epithelium, and shreds of membrane. The change of colour is caused by the blood diminishing, and its place being taken by fatty granules and leucocytes.

The above-mentioned signs of recent delivery are well

marked for the first few days; after the lapse of a week they may be difficult of recognition, and after ten days or a fortnight have passed it may be very difficult or impossible to make an absolute diagnosis of *recent* delivery. It should be carefully remembered that recently delivered women may pursue their ordinary avocations without their friends being aware that anything out of the ordinary has occurred. There is a tendency to under-estimate the capacity for endurance and the strength of the recently delivered woman. Amongst savage women the period immediately after delivery is not generally regarded as one requiring special rest and care. Indian and African women, if on a march with their tribe, will, at the time of delivery, frequently step aside into a wood, there be delivered without assistance, and then, carrying the child, will at once resume the march. This capacity for endurance immediately after delivery is, however, not confined to savage women, but may be shared by civilised women, as the following cases show. An unmarried girl, aged eighteen years, was delivered of a child during the night. The delivery caused so little disturbance as not even to excite the suspicion of any member of the family. The girl came down to breakfast the next morning as though nothing unusual had happened, walked to the school where she taught, a distance of half a mile, and when her duties were over, returned in the evening. The next day she walked twelve miles, and was married on the fifth day after her confinement.¹ The wife of a labouring man started from Deptford to walk to Dartford, where it was intended that her confinement should take place. When, however, she had gone about four miles on her road she began to feel the pains of labour, and enquired the way to the nearest workhouse. Before she could reach it she became unable to walk, and the child was born at half-past nine at night on Woolwich Common. A woman, who happened to be near, assisted her, and then promised to send someone to look after her. The mother got tired of waiting, and trudged

¹ *Med. and Surg. Reporter*, Philadelphia, 1868.

on alone a distance of about two miles to the workhouse, which she reached about midnight. There the porter did not believe her story, and told her she must find a policeman; when she had done so she had to walk with him another mile and a half to the Woolwich police station. She was there seen by the police surgeon, and sent to the infirmary in an ambulance. No harm, apparently, occurred to this woman after the long walk of three miles and a half almost immediately after her delivery.¹ The following cases are related by Taylor and Stevenson:—A woman was engaged in reaping; she retired to a little distance, effected her delivery by herself, and went on with her work for the remainder of the day, appearing only a little thinner and paler than usual. In a case that became the subject of a trial (*Reg. v. Stowler*, Wells Ass., 1865), two witnesses proved that the prisoner, who was tried for the murder of her child, was at work with them in a field about 800 yards from a pond in which the body was afterwards found. They left the prisoner weeding, returned in about an hour, and she was not then in the field. After a time she returned, sat on a bank, and then resumed her work. The witnesses noticed that, on her return, there was a great difference in her appearance. In this short interval she had been delivered, had disposed of the body of the child, and resumed her work, as if nothing had happened. In another case, a domestic servant was being driven home from market in a cart; on her way she got out, went to a recess in the hedge by the side of the road, and in five minutes was observed following the cart, and walked home, a distance of a mile and a half. She went about her usual work on that and the following day. The woman had been delivered of a child in the recess, and it was subsequently found there. One witness heard it cry, but it soon died.

¹ *The Lancet*, 1891.

FURTHER SIGNS OF RECENT DELIVERY REVEALED AT A POST-MORTEM EXAMINATION

Such search is almost entirely limited to cases of criminal abortion, where the emptying of the uterus has resulted in the death of the woman. These further signs are obtained by an inspection of the uterus and its appendages. The following are the appearances of these organs when the body is examined soon after delivery at full period.

1. **Uterus.**—If death has occurred soon after delivery, the uterus resembles a large flabby bag, with the os wide open, and the cavity containing clots. The surface is covered with the remains of the decidua, and the site formerly occupied by the placenta is darker in colour than the rest of the organ, and shows the openings of the uterine sinuses. The size of the uterus depends on the interval that has elapsed between delivery and the occurrence of death. If death occur almost immediately after delivery, the length of the uterus is from nine to twelve inches, provided no efficient contraction has taken place previous to death; if from one to two days after delivery, the length is about seven inches; if about one week after delivery, the length is from five to six inches; if about two weeks after delivery, the length is about five inches; in about a month the uterus will have contracted to its normal size, but the os rarely, if ever, closes so completely as in the virgin state. After the lapse, therefore, of four weeks, it may be as difficult to determine the existence of recent delivery in the dead as in the living.

2. **Corpus luteum.**—For a discussion as to the value of the so-called true corpus luteum, or corpus luteum of pregnancy, see p. 160.

SIGNS OF DELIVERY AT A REMOTE PERIOD

These may be difficult to detect only a few days after delivery, and after the lapse of two or three months it may be impossible to give a sure opinion. In women who have been

delivered at term the cervix uteri is irregular, the os is puckered and fissured, and is more open than in nulliparous women, generally admitting the tip of the finger. If the hymen be present, it is proof that no mature infant can have been born *per vias naturales*, and if the posterior commissure be intact, it indicates that the woman has not given birth to a mature infant *per vias naturales*.

The only additional evidence of remote delivery to be obtained at a post-mortem examination is derived from inspection of the walls and cavity of the uterus. The uterus of a woman who has been delivered of a child remains somewhat larger and heavier than the virgin uterus; the walls are thicker, and the cavity is less triangular in outline, the angles where the Fallopian tubes enter being rounded off. Cicatrices around the external os may indicate the seat of past rents. In some cases, however, it is impossible to definitely say whether a given uterus is parous or nulliparous.

UNCONSCIOUS DELIVERY

The question as to whether a woman can be delivered of a child unconsciously at once admits of an affirmative answer. The contractile power of the uterus is independent of volition, and the results of deliveries under the influence of anæsthetics demonstrate that the expulsive power of the uterus may be as energetic in the unconscious as in the conscious state. Delivery may take place when a woman is unconscious from any of the following conditions—the use of narcotic poisons or vapours, coma, profound sleep, asphyxia, syncope, or the use of intoxicating liquors.

It is highly improbable that a primiparous woman should be delivered during ordinary sleep without being roused to a sense of her condition. Instances, however, of unusually rapid first labour have been recorded, of which the two following may be taken as examples:—

Wharrie¹ relates the case of a primiparous woman, aged

¹ *Cormack's Jour.*, 1846.

twenty-one, who was in labour for six hours, without complaining of any pain. The child was born without effort or consciousness; it was small, weighing rather more than four pounds.

A case has been recently recorded¹ of a strong, healthy, primiparous young woman who, at full term, was taken suddenly in the night with rapid labour pains. She immediately sent her husband for the midwife; but during his absence she experienced a desire to defæcate, went to the night-stool, had a strong pain, and felt something pass away, after which she became unconscious. On the arrival of the midwife in a few minutes it was found that the woman had given birth to a full-time infant, which was head downwards in the excreta in the pan, and was dead.

The plea of unconscious delivery is a common defence put forward by women charged with infanticide. A woman accused of this crime will not uncommonly state that, while suffering from labour pains, she felt a strong desire to evacuate the bowels (a very common symptom during, or just previous to, labour), and that while so engaged the child was suddenly born without her knowledge, and so fell into the privy or water-closet in which it was found. This subject will be referred to again in connection with the article on infanticide, but the following case illustrates the fact that a child may be expelled during defæcation, without the mother being aware that she was in labour till the expulsion of the child had taken place. Laugier² relates the case of a woman, who had previously borne a child, who was admitted into a hospital on January 9th when about eight months pregnant. On February 18th she had colicky pains, which she attributed to five days' constipation. An enema was given, and directly afterwards she sprang out of bed. The enema with fæces was at once expelled, and at the same time the child was delivered, being shot into the chamber-vessel, falling more than a foot downwards, as the

¹ *Brit. Med. Jour.*, 1894.

² *Jour. des Sages-Femmes*, and *Brit. Med. Jour.*, 1894.

mother had not time to sit fairly on the vessel. The child was saved, and the placenta was expelled a quarter of an hour later without difficulty. The mother had not the slightest idea that labour was coming on, though she knew that term was at hand, and remembered that her first child had been delivered just as rapidly and as painlessly three years previously.

TIME REQUIRED TO ELAPSE AFTER DELIVERY BEFORE
CONCEPTION CAN AGAIN OCCUR

It is generally supposed that about one month must elapse before the generative organs of the female can revert to the condition necessary for the exercise of their procreative functions. This is probably correct as a general rule, but from a number of statistics it appears that conception may occur within this period, and that the fourteenth day after delivery is the earliest at which a fresh impregnation can take place.

CHAPTER XXXV

Abortion—Natural abortion—Artificial abortion—Criminal abortion—Noxious substances—Methods used to procure criminal abortion—Emmenagogues and ecbolics—Signs of abortion in the living and dead.

IN medical language the term *abortion* is generally understood to refer to the expulsion of the contents of the uterus before the sixth month of gestation—*i.e.* before the foetus is considered viable. If delivery occur between the sixth and ninth months, but before full term, it is called a *premature labour*. By *criminal abortion* is meant unlawfully producing the expulsion of the contents of the gravid uterus at any period of gestation short of full term. The popular term *miscarriage* is applied especially to an abortion occurring before the sixth month of gestation, but is also sometimes loosely applied to a premature labour. The law makes no distinction between an abortion, a miscarriage, and a premature labour; in the legal sense the term *abortion* is applied to the expulsion of the contents of the gravid uterus *at any period of gestation short of full term*.

For convenience of description abortion may be divided into three classes:—(1) Natural abortion; (2) Artificial abortion, and (3) Criminal abortion or foeticide.

NATURAL ABORTION

A natural abortion is, in medical language, termed a *miscarriage* if it consist of the expulsion of an ovum or of a non-viable foetus before the sixth month of gestation, and a *premature labour* if it consist of the expulsion of a viable child between the sixth and ninth months. There are many causes of natural

abortion, for a detailed description of which obstetric works should be consulted. Briefly they may be divided into the maternal and foetal causes of abortion. The maternal causes are—poisons in the mother's blood (syphilis, the poisons of the specific fevers, uræmia, &c.), impoverishment of the mother's blood (anæmia, over-lactation, &c.), mechanical disturbances of the circulation (heart, lung, and liver diseases), nervous causes (chorea, fear, anxiety, &c.), uterine diseases or affections (inflammation, tumour, displacements, &c.), and over-excitement of the sexual organs by excessive sexual intercourse (it is probable that the apparent sterility of prostitutes is not due to actual non-conception, but to their frequently aborting at very early periods of gestation). The foetal causes of abortion are either diseases of the membranes of the ovum or foetus, or diseases of the embryo itself.

It should be borne in mind, since it is contrary to the popular idea, that the earlier the period at which abortion occurs, the greater is the danger to the woman. At early periods of gestation the contractile powers of the uterine walls are limited, so that hæmorrhage is very likely to result from non-occlusion of the bleeding vessels; in addition, if the uterus has not contracted thoroughly, the open sinuses are liable to absorb septic matter, so that septic infection is of much more frequent occurrence if abortion occur at early periods than after delivery at full term. At or near the completion of term the uterus has become a collection of powerful muscles, which, after delivery, are able to contract firmly, and so occlude the bleeding vessels.

ARTIFICIAL ABORTION

This refers to the induction of premature labour which has been resorted to for the purpose of saving the life of the mother, and, if possible, that of the child. There is no formal recognition by the law of the induction of premature labour by medical practitioners, but judges have always upheld the moral justification of the act, when the object has been to save the

life of the mother, and also that of the child, if such be possible. With regard to the latter point, the case should be a very exceptional one where it becomes necessary to induce abortion before the child has attained to a viable period. The induction of premature labour may become necessary under any of the following conditions:—

1. Deformities of the pelvis rendering the passage of the head of a full-term child impossible.
2. Narrowing of the soft passages, from contraction of cicatrices in the vagina.
3. Very severe chorea complicating pregnancy.
4. Insanity occurring as a complication of pregnancy.
5. Cases of cancer and tumours of the uterus.
6. Cases of placenta prævia.
7. Cases of severe and prolonged vomiting, which will not yield to remedies, and where a fatal result is feared.
8. Cases of rupture of the uterus.

The time that elapses between the performance of the operation for the induction of abortion and the commencement of labour varies considerably; as a general rule, uterine action is established in from fifty to sixty hours, but it may take much longer. It is on account of this delay in the induction of labour that the abortion-monger, either fearing failure in the means adopted, or urged by the victim to proceed to further measures, not uncommonly resorts to such violence or inflicts such injury on the uterus as to cause the death of the victim.

A medical practitioner who decides, after mature and careful consideration, that the induction of premature labour is necessary in order to save the life of the mother, should, in order to protect himself from a possible action at law, pay careful attention to the two following points: (i) to have the opinion and agreement of a second medical practitioner before undertaking the operation; (ii) to have the full consent to the operation, in writing, of the husband or guardian of the woman, and, if possible, of the woman herself.

CRIMINAL ABORTION

With regard to the criminality of this act, the offence is not in any respect condoned by the woman consenting to or even soliciting the performance of the operation; nor does the law of England require proof of pregnancy as an essential to the crime of attempted abortion; for instance, a person may attempt to procure an abortion upon a woman suffering from an ovarian or uterine tumour, in the belief that the enlargement is due to pregnancy; in such a case, the criminality of the act is rightly gauged by the intention of the individual when committing that act. The criminality of abortion is also not affected by the fact of the child being dead in the womb, nor by the fact that the womb contains a monster or mole, nor by the fact of extra-uterine pregnancy. In addition, it is not necessary that abortion should follow the attempt to procure it, in order to constitute the crime. If a woman die in consequence of the procurement of, or the attempt to procure, criminal abortion, the person procuring or attempting to procure the abortion is guilty of murder, although that person may have had no intention of causing the woman's death, and although the woman consented to the performance of the operation or the taking of drugs. Under special circumstances the crime may be reduced to manslaughter.

The law (24 & 25 Vict. ch. 100, ss. 58 & 59) is thus expressed:—‘Every woman being with child, who, with intent to procure her own miscarriage, shall unlawfully administer to herself any poison or other noxious thing, or shall unlawfully use any instrument or other means whatsoever, with like intent, and whosoever with intent to procure the miscarriage of any woman, whether she be or be not with child, shall unlawfully administer, &c., shall be guilty of felony.

‘Whosoever shall unlawfully supply or procure any poison or other noxious thing, or any instrument or thing whatsoever, knowing that the same is intended to be unlawfully used or employed with the intent to procure the miscarriage of any

woman, whether she be or be not with child, shall be guilty of a misdemeanour.'

The production of abortion by local violence or by instruments, owing to the serious nature of the operation, and the not uncommon ignorance of the operators, and in the case of drugs the administration, if they are to succeed, of large and poisonous doses, frequently results in death or in serious after consequences.

Noxious substances.—With regard to the reference to a 'noxious thing' in the sections of the Act quoted above, the question arises as to what is a noxious thing within the meaning of the Act? This has to be determined in individual cases by medical evidence, so that a great responsibility is consequently thrown on medical witnesses in such cases. A substance may be noxious according to the form, quantity, or frequency with which it is administered. A substance, harmless under certain conditions, may be noxious if administered in a large dose, especially to a pregnant woman. Aloes, jalap, and purgatives generally, though innocent when taken in small doses, may, when administered frequently or in large doses to a pregnant woman, or to a woman whom the administrator believes to be pregnant, become noxious things. The term 'noxious' is therefore not to be limited to what is strictly speaking a poisonous substance, but to what may under certain conditions be injurious or liable to produce injury, if administered with a criminal intention.

In the case of *Reg. v. Cramp* (Kent Ass., 1880) the question as to the meaning of a noxious thing arose, and was reserved for the consideration of the C.C. Cases Reserved. The question before the court was—Must the drug be injurious or noxious in itself, and not merely when administered in excess? The court decided 'that in each case it was a question for the jury to say whether the substance, administered as it was, and under the circumstances in which it was administered, was a noxious thing. Therefore neither principle nor authority precludes us from holding what is certainly good sense—that if a

person administer, with intent to produce miscarriage, something which as administered is noxious, he administers a noxious thing.' Judges generally attach a much stricter meaning to the word 'noxious' when the substance has been administered with the object of procuring abortion than when it is simply administered with the intention of aggrieving or annoying a person. In order to complete the offence, it is not necessary, as previously stated, that abortion should have followed, nor is medical proof of specific injury done to the woman necessarily required.

With reference to the words 'other means whatsoever' in the first section of the Act previously quoted (p. 176), different interpretations have been placed on them by various judges. In *Reg. v. Wallis* (Winchester Ass., 1871), Brett J., in charging the grand jury, said that, having regard to the words 'other means whatsoever,' he should direct that in one count of the indictment the word 'noxious' should be omitted, and he should hold that, if the person accused did administer some drug or something which he thought would procure miscarriage with that intent, although the thing itself would not procure that miscarriage, he would nevertheless be guilty of the offence, and they ought to find a true bill. According to this ruling, medical evidence as to the noxious nature of a substance would not be necessary. Such a meaning is not, however, by any means universally attached by judges to the words referred to.

Criminal abortion is seldom attempted before the third month of gestation, and is most commonly attempted between the fourth and fifth months, because, owing to the occurrence of the symptoms of quickening, a woman then realises, with almost absolute certainty, the fact of her pregnancy. To this, exception must be made as regards the attempts at abortion, generally in the form of the administration or taking of drugs, when a woman imagines herself to be pregnant on account of the lapse of a monthly period. The law of England makes no distinction as to the time of commission of the act of abortion, whether it be produced before or after quickening. The ovum

acquires vitality from the moment of its impregnation, and from that moment the attempt to unlawfully procure abortion becomes a criminal offence.

The methods used to procure, or to attempt to procure, criminal abortion may be classified under the three following headings:—

1. Violence applied generally.
2. The administration of reputed abortifacient drugs.
3. Mechanical injuries inflicted on the uterus and its contents.

I. Violence applied generally.—General violence is very uncertain in its effects on the pregnant uterus. It is well known that under certain conditions pregnant women may be subjected to severe mechanical violence without the production of abortion, while, under other conditions, very slight violence may cause a woman to abort. Many violent means are not unfrequently resorted to by women in their endeavours to procure abortion. Severe exercise, either in the form of long walks, or of violent shaking of the body by riding or driving over rough roads, is sometimes resorted to; or they will throw themselves down a hill or downstairs, or jump from a table or other height. They will even sometimes submit to be trampled on or kicked on the abdomen, and excessive tight-lacing has been resorted to in the hope of procuring miscarriage. Copious bleeding and the repeated use of very hot and very cold baths have been resorted to, but usually fail in producing the desired effect.

II. The administration of reputed abortifacient drugs.—This method of procuring, or attempting to procure, criminal abortion is more frequently resorted to than any other. Drugs, however, seldom answer the purpose of producing abortion, and when such a result is attained, it is generally from the administration of a poisonous quantity, so that the abortion which is produced is frequently followed by the death of the woman. Moreover, such drugs when administered in poisonous doses not unfrequently cause the death of the woman without the

production of abortion at all. It may be taken that all poisons, in sufficient doses, may act as ecbolics, especially to those disposed to miscarry, on account of their general action on the system; but, when administered in such doses, they generally prove fatal to the life of the woman.

The various mineral poisons have been ignorantly used with the object of producing abortion—arsenic, mercuric chloride, copper sulphate, potassium bichromate, perchloride of iron, and ferrous sulphate have been administered with this object. With regard to the fear that some medical practitioners have of prescribing iron salts during pregnancy, cases have been recorded in which large doses of the tincture of perchloride of iron have been given without the production of abortion; the administration of medicinal doses of iron preparations in suitable cases throughout pregnancy is sanctioned by eminent physicians, and is certainly both justifiable and harmless as regards the exercise of any abortive action. Pope¹ records a case of fatal poisoning by the self-administration of 'diachylon'—lead plaster—for the purpose of procuring abortion. The woman was twenty-two years of age; after taking the lead plaster, anæmia and peripheral neuritis gradually supervened, and death followed. At the post-mortem examination the uterus was found of normal size, the lining membrane healthy, and no corpus luteum in either ovary. There was a well-marked blue line round the gums, which had been inconspicuous before death. A relative of the deceased stated at the inquest that some weeks previously the deceased had informed her that she had purchased 'diachylon,' which she made into pills, and took with the object of producing abortion. Drastic purgatives are frequently resorted to by women with the intention of procuring abortion, but, unless taken in poisonous doses, they fail in producing the desired effect. Croton oil, elaterium, gamboge, and colocynth have been taken for this purpose. Two preparations of aloes—a powder named 'hierapicra,' which is a mixture of aloes and canella, and 'pill cochia,'

¹ *Brit. Med. Jour.*, 1893.

which is a pill containing aloes and colocynth—are much used as purgatives amongst the poor; in large doses they are supposed to have abortifacient properties, and are frequently taken for the purpose of inducing abortion.

The substances previously mentioned exert no action on the uterus unless they are taken in poisonous doses, when they may have an indirect action on that organ by causing shock to the general system. There are certain drugs, however, which are believed to exercise some direct effect on the uterus; these are the *emmenagogues* and *ecbolics*. In some trials for abortion considerable confusion has arisen in the use of these terms; it is of some importance that the medical jurist should be acquainted with the meanings of the words, since in the case of persons possessing some knowledge of the properties of drugs, the administration of a supposed or reputed ecboic is likely to be much more significant than that of a drug merely known as an emmenagogue. An accused person may state in defence that he was unaware of the pregnancy of the woman, and that she merely told him she was suffering from a temporary cessation of menstruation; the veracity of this account might possibly receive some confirmation if a simple emmenagogue had been given, whereas the administration of a reputed ecboic would throw doubt on the truthfulness of the explanation.

Emmenagogues (ἐμμήνια, the menstrual discharge, and ἀγωγός, exciting).—These are medicines which excite or promote menstruation, by stimulating the blood circulation of the uterus. The following substances have or have had a common reputation as emmenagogues—aloes, pennyroyal, preparations of iron, gin, savin, rue, borax, gamboge, and black hellebore. Savin, although sometimes employed as an emmenagogue, is better known as an abortive; its employment is suspicious of criminal intent.

Ecbolics (ἐκβόλιον, for causing abortion).—These are drugs which excite uterine contractions, and thereby promote expulsion of the contents of the uterus. No infallible ecboic is known; when abortion has resulted from the employment of

drugs, it has been due either to a predisposing condition of the uterus or its contents, or to the toxic action of the substance taken.

The drug which bears the chief reputation for being an ecboic is *ergot*. This drug is certainly capable of causing contractions of the uterus during the later stages of pregnancy, but in the earlier stages it is doubtful whether it can initiate contractions of the uterus, or produce them with sufficient force to cause the expulsion of the uterine contents. Some observers believe that ergot does not act upon the uterus unless the natural contractions of that organ have already commenced; but since, during pregnancy, uterine contractions normally occur, it is conceivable that ergot may be able to increase the force of those contractions, although in the earlier months of pregnancy it may not be able to augment them sufficiently to procure abortion. It is certain that ergot frequently fails to bring about a miscarriage, although very large and repeated doses have been tried, and death has resulted from the administration of ergot without abortion having occurred. In a case of suspected criminal abortion, investigated by the author several years ago, a large quantity of the liquid extract of ergot was found in the stomach; death had resulted from uterine hæmorrhage, but the fœtus (fourth or fifth month) was still within the uterus undetached. When abortion has been produced by the employment of ergot, it is probably due to the general toxic effects of the drug. Tardieu¹ reports the case of a woman, four months pregnant, who aborted in consequence of taking ergot, and died from peritonitis twenty-four hours later. Richter² reports the case of a girl, six to seven months pregnant, who, after taking a large dose of ergot, aborted and died from profuse hæmorrhage half an hour later; this girl suffered from the symptoms of acute ergot poisoning.

Another drug that bears a reputation for being both an emmenagogue and ecboic is *savin*. This drug is especially

¹ *Annales d'Hygiène*, 1855. ² *Vierteljahrsschr. f. ger. Med.*, 1861.

considered among ignorant people to be an abortive, and is frequently administered for this purpose in the form of powdered savin, or as a decoction or infusion of the savin tops, or as the oil of savin. The drug is neither a real emmenagogue nor ecboic. It is a vegetable irritant poison, and if taken, either in the form of oil of savin or of a preparation of savin tops, it generally produces illness or death of the woman, without abortion being effected. If uterine contractions are set up by savin, and the contents of the uterus expelled, the result is brought about by the powerful irritant effect of the savin upon the stomach and intestines, causing a reflex contraction of the uterus from stimulation of the sympathetic nerve-endings. In such a case the expulsion of the contents of the uterus is almost certainly followed by the death of the woman, and death is generally preceded by hæmorrhage. Savin is a drug which should not be given to pregnant women. *Rue*, *tansy*, and *saffron* are drugs which have been employed with the object of producing abortion; they are neither real ecboics nor emmenagogues. The *oil of pennyroyal* has the popular reputation of being an emmenagogue and ecboic; for reference to its reputed ecboic properties see i. p. 347. *Cantharides* is a drug which has been administered both for the purpose of procuring criminal abortion and to excite the sexual feelings. It is neither an ecboic nor an aphrodisiac; it is a very powerful general irritant, causing enteritis, hæmaturia, inflammation and swelling of the sexual organs, and may cause emptying of the uterus as a result of contractions produced reflexly, but in such a case the death of the woman always follows. Baldwin¹ relates the case of a woman, aged thirty-one, who had been pregnant about ten or eleven weeks, and who took 120 grains of pure quinine. This produced retching and slight vomiting in a few minutes, and purgation about half an hour later. Forcing-down pains occurred about three hours after taking the quinine, and twenty-one hours after taking the drug the foetus was expelled. The woman made a good recovery.

¹ *Brit. Med. Jour.*, 1895.

III. **Mechanical injuries inflicted on the uterus and its contents.**—Mechanical means applied so as to disturb the relation between the uterus and its contents are more effectual in producing abortion than the use of drugs, and there is, unfortunately, but little doubt that a number of persons in England practise this crime as a means of livelihood, employing instruments of various kinds. Taylor and Stevenson state that a method much resorted to in the metropolis is to rupture the membranes by the insertion of a piece of whalebone or wire into the mouth of the womb till blood appears; pills of oil of savin, sulphate of iron and aloes are then freely given to aid in the expulsion of the ovum. Abortion is frequently brought about by the insertion of a male catheter, or bougie, between the membranes and the uterine wall; or by the passage of a sound into the uterus; or by dilatation of the os; or by vaginal douches of warm water. Stevenson states that he met with the case of a married woman on whom an unqualified practitioner had successfully operated ten times, and who in addition had had abortion successfully induced by a female abortionist.

As the operation of procuring criminal abortion by mechanical means is frequently performed by ignorant persons, the death of the woman not uncommonly results from inflammation of the uterus, septicæmia, or peritonitis. An attempt is generally made by an abortionist to pass the instrument through the os, with the object of puncturing the foetal membranes, but an ignorant person, who is very likely to use an excessive amount of force, may miss the os altogether, and perforate either the body of the uterus or the cervix. If the death of the woman occur under these circumstances, the crime is murder, although the abortionist may not have intended to take the life of the woman; if there are extenuating circumstances, the crime may be reduced to manslaughter.

Unless the death of the woman occurs, cases of the production of criminal abortion seldom come before the courts of law, since the woman is a soliciting and consenting party to the crime, and therefore uses every endeavour to conceal it. When

a fatal result ensues, it is generally due to ignorance and recklessness on the part of the abortionist, or to impatience on his or the woman's part at the desired result not occurring within a few hours, which consequently induces him to resort to unnecessary violence.

An abortion is sometimes procured by fraud on the part of a woman, who consults a medical man with a history of displacement of the womb, at the same time carefully concealing from him, by evasive or untruthful answers, the fact of pregnancy. A medical man is thus very apt to be taken off his guard, and may be led to pass a sound into the uterus with the object of ascertaining the existence of displacement, or of remedying it, and so ultimately producing an abortion. It is possible, however, for a uterine sound to be passed into the cavity of the gravid uterus without causing abortion, provided the sound passes between the uterine wall and the membranes, without rupturing the latter.

Abortion may be caused by the injection of some substance into the vagina. Injections of tepid or hot water have been known to induce premature labour in advanced pregnancy. Irritant and corrosive substances have also been injected into the vagina with the object of procuring abortion. A few years ago a man was tried in London for causing the death of a woman by injecting a solution of the acid nitrate of mercury into the vagina, and possibly into the uterus. Death occurred without abortion having been procured.

SIGNS OF ABORTION IN THE LIVING AND DEAD

These are practically the same as those of delivery. In addition, careful search should be made for indications of the use of instruments or of the employment of violence of any kind.

In the living the indications that abortion has taken place vary with the term of gestation at which it happened, and the time that has intervened between the occurrence of the abor-

tion and the examination. If the abortion occur during the first two months of pregnancy, an early examination will probably show little more disturbance of the parts than is found after a menstrual period; whilst in a few days nothing unusual would probably be seen. As pregnancy advances, the signs of abortion resemble those described as attending delivery at term. The examination for signs of an alleged abortion should be made within twenty-four hours of the occurrence, or very little useful information will be obtained.

In cases of suspected abortion a careful examination of any substances expelled from the uterus should be made. If there be a foetus, it should be examined in order to determine the stage of intra-uterine life it had reached (see pp. 159 and 189), whether it was born alive, and if so, to what cause its death was probably due. Punctures or wounds upon the foetus should be searched for, and, if present, an attempt should be made to decide whether such injuries were caused during life or after death, as the defence might be raised that the injuries were caused after birth. If the expelled substances do not contain a foetus, they should be carefully examined for moles, so-called uterine hydatids, polypi, membranes, and false membranes. The latter may be due to dysmenorrhœa, and not the result of impregnation at all.

Post-mortem examination of the female.—If death has occurred within three or four days of the attempt to procure abortion, the case can generally be made out satisfactorily; but if the woman has survived for three or four weeks, it may be impossible to determine the fact of abortion, owing to the signs having disappeared, especially if the abortion occurred in the early stages of pregnancy. Careful search should be made for punctures, lacerations, and incisions in the vagina, uterus, and the contiguous organs. These wounds, and especially punctures, may be multiple, as it is not uncommon for an ignorant abortionist to make more than one stab at random with the instrument he is employing. The uterus with the vagina attached should be very carefully removed, so as not to

injure it in any way. A measurement of its length (see p. 155) should be made, and if a foetus be present, its probable age should be determined (see pp. 159 and 189). The appearances of the walls of the uterus, signs of inflammation within its cavity, signs of perimetritis, and the presence or absence of mucous membrane in the cavity are to be noted. The site of the placenta should be searched for, and can probably be made out after the third month of gestation. Care should be taken not to mistake the peculiar appearances of the uterus of a recently delivered woman—which frequently appears bruised, and as if it had been subjected to violence—for the results of mechanical ill-usage. The presence or absence of peritonitis, especially in the vicinity of the uterus, should be noted; if the peritonitis be the result of mechanical violence, it is usually more localised than that which occasionally occurs as a complication of puerperal cases at term. The appearances resulting from menstruation—a thickened state of the uterus, and a swollen and hyperæmic condition of its mucous membrane—should not be mistaken for those produced by abortion. The stomach, intestines, liver, kidneys, and bladder should always be examined for signs of irritant poisoning.

CHAPTER XXXVI

Infanticide—Determination of the age of a fœtus or infant - Evidences of a child having lived—Hydrostatic test—Breslau's test—Period of time that an infant has survived its birth—Causes of death of the new-born child—Concealment of birth.

INFANTICIDE

INFANTICIDE is a term which is restricted to the criminal destruction of a new-born child. In a legal sense it is immaterial whether the child be killed directly it is completely born or soon after. The law of England treats infanticide as ordinary murder; but in such cases juries are not infrequently reluctant to return a verdict of murder, often on account of a feeling of commiseration for the prisoner, owing to her having been seduced and deserted, and therefore convict her only of the minor offence of concealment of birth. In the great majority of cases of alleged infanticide, the establishment of the charge of murder depends upon the medical evidence, as proof is required of the separate existence of the infant from the mother in order that the crime of murder can have been perpetrated. An infant which is partially born, although it may breathe and show other signs of life, has not in the legal sense a separate existence, and until it has a separate existence the crime of infanticide, according to the law, cannot be perpetrated. At a trial for infanticide the medical witness has, therefore, not only to testify to the cause of death as in an ordinary case of murder, but in addition has to give evidence, if possible, as to whether the infant breathed, and whether it was or was not born alive. As many infants are born dead, and may also die from natural causes either

during birth or shortly afterwards, and as the signs of an infant having been born alive are frequently indistinct, the law assumes, in order to guard against erroneous convictions, that every new-born child has been born dead unless the contrary is proved by medical evidence, so that the burden of proof that a *living* child was destroyed is thrown upon the prosecution.

The medical questions requiring solution in a case of infanticide relate to both the mother and infant. The question as regards the *accused woman* is—Has she been delivered of a child recently, or at a period consistent with the time that has apparently elapsed since the birth of the infant? This question has been already fully discussed under the signs of delivery (see pp. 165–170). As regards the *infant*, the points that require investigation whenever the body of a new-born child is being examined for medico-legal purposes are :—

I. To determine the age, or stage of intra-uterine life, which it has reached.

II. To determine whether it has lived to breathe.

III. To determine whether it has been born alive, and if so, the period of time that has elapsed since its death.

IV. To determine the cause of death, whether natural or violent.

1. THE STAGE OF INTRA-UTERINE LIFE, OR THE AGE OF THE CHILD

In most cases of infanticide, the child has arrived at the full term of gestation ; but as children may be born at an earlier period, the medical witness must be prepared in such cases to give an opinion as to the probable stage of intra-uterine life to which the child had attained. Such an opinion must be based upon a knowledge of the size, weight, appearance, and development of the foetus at the different periods of intra-uterine life. As a case of infanticide is not likely to form the subject of investigation before the completion of the sixth month of gestation, the following tabulation comprises the appearances presented by the foetus from the sixth month

to the full term of utero-gestation. The periods are stated in complete months—viz. at the termination respectively of the sixth, seventh, eighth, and ninth months. For the appearances presented by the foetus at earlier stages of gestation than the sixth month, see p. 159.

Six months.—Length, nine to twelve inches; weight, one to two pounds. The skin is red and wrinkled, the latter appearance being due to the almost complete absence of subcutaneous fat, which is only just commencing to form. The body is covered with downy hair or lanugo, and also with a thin layer of vernix caseosa. The bones of the head are widely separated at the sutures. There is no hair upon the scalp with the exception of the lanugo; the eyebrows and the eyelashes are beginning to form. The eyelids are adherent, and the pupillary membrane is present. The external auricle of the ear measures sixteen to twenty-four millimetres in length ($\frac{1}{6}$ to $\frac{1}{5}$ of an inch). The umbilical cord is inserted considerably below the middle of the body, owing to the greater development of the head and trunk as compared with the lower extremities. The head is large in proportion to the body. The scrotum is smooth and empty. The finger-nails are just forming; the toe-nails are less developed. Internally, the brain shows the formation of the fissure of Sylvius, and the commencing development of the precentral, inferior frontal, and intra-parietal sulci of the cortex. The testicles are in the abdominal cavity, lying on the psoas muscles immediately below the kidneys. The small intestine contains a little mucoid secretion, which may be coloured with bile-pigment. Centres of ossification are present in the manubrium, os calcis, and in the bodies and laminæ of the sacral vertebræ.

Seven months.—Length, twelve to fifteen inches; weight, two to four pounds. The skin is somewhat paler, and is well covered with lanugo and vernix caseosa. Fat is beginning to be deposited in the cellular tissue. The lanugo of the scalp is assuming the character of hair, and is becoming darker. The eyelids are not adherent, and the pupillary membrane is begin-

ning to disappear. The external auricle measures about twenty-six millimetres in length (1 inch). The finger-nails are firmer, but do not quite reach to the extremities of the fingers. The testicles are commencing their descent to the scrotum, and are near the abdominal rings. On the cortex of the brain the superior precentral and the superior frontal sulci are appearing. The large intestine contains meconium. Centres of ossification are present in the first piece of the body of the sternum, and in the astragalus.

Eight months.—Length, fifteen to eighteen inches; weight, four to five pounds. The skin is a little paler, and the body is becoming plumper from the deposition of subcutaneous fat; the skin of the face is still wrinkled. The lanugo is disappearing. The hair on the scalp is becoming well developed. The pupillary membrane has disappeared, and the eyelids are not adherent. The external auricle measures twenty-six to twenty-eight millimetres in length (1 to $1\frac{1}{2}$ inch). The insertion of the umbilical cord is slightly below the middle of the body. The testicles are in the inguinal canals, or they may have reached the upper part of the scrotum, especially the left testicle. The nails are well developed, and have reached the extremities of the fingers, and nearly to the extremities of the toes. The small intestine shows the formation of *valvulæ conniventes*. The large intestine is almost filled with meconium. The bladder may contain urine. A centre of ossification is present in the second piece of the body of the sternum.

Nine months (signs of maturity).—Length, eighteen to twenty inches. Weight, five to eight pounds, the average weight being about six and a half pounds. The skin is pale, and nearly resembles in colour that of the adult. The subcutaneous tissue is well filled with fat, so as to impart firmness and plumpness to the limbs and body, and the face is smooth and free from wrinkles. The lanugo is almost entirely absent, and *vernix caseosa* is only present in any quantity behind the ears, in the axillæ, on the back, and on the flexor aspect of the limbs. The parietal and occipital bones are freely movable,

being only united by membrane, but the bones of the skull are in apposition along the lines of the sutures. The hair on the head is well developed and is about an inch long, and the eye-lashes are well formed. The external auricle measures thirty-three to thirty-six millimetres in length ($1\frac{1}{4}$ to $1\frac{1}{2}$ inches). The umbilicus is about three-quarters of an inch below the mid-point of the body. The scrotum is corrugated, and contains the testicles. The nails project beyond the tips of the fingers, and reach the ends of the toes. The surface of the brain is convoluted, and the secondary sulci are appearing. Meconium is present in the large intestine only, which is filled with it. There is a well-developed centre of ossification in the lower end of the femur, measuring generally not less than one-fifth of an inch in diameter. Great stress is placed upon the presence of this centre of ossification in investigating the maturity of the foetus in cases of alleged infanticide. It usually appears about two weeks before full term, and at the full period measures from one-fifth to one-third of an inch in diameter. Centres of ossification are also present in the third piece of the body of the sternum, in the cuboid bone, and in the first coccygeal vertebra.

Very considerable variations may take place in the length and weight of a child born at full term, and it should be remembered that the male child generally exceeds the female in both respects. The following are two instances in which the length and weight of children born at full term have considerably exceeded the average. Davies¹ records a case in which a child was born alive, weighing nineteen pounds two ounces. Ortega² delivered a woman of a still-born child which measured twenty-seven inches in length and weighed twenty-four and three-quarter pounds.

If putrefactive changes are much advanced in the body of the infant, many of the developmental indications mentioned above may be obscured or unrecognisable. Perhaps the best

¹ *Med. Times and Gaz.*, 1860.

² *Nouvelles Arch. d'Obstét. et de Gynécol.*, 1891.

indication as to the maturity of the fœtus is the presence of the centre of ossification in the lower epiphysis of the femur, which can be recognised even when putrefactive changes are far advanced. The length of the external ear also furnishes a good test of the age of the fœtus; this method was first pointed out by Trötsch, and its value has been confirmed by Stevenson.

On p. 194 is a tabulated form of the principal developmental changes which take place in the fœtus from six months to full term.

For the various appearances and changes by which the age of a child that has lived some time may be determined, see i. pp. 81-85.

2. EVIDENCES AS TO WHETHER THE CHILD LIVED TO BREATHE

The evidence as to whether an infant was alive at the time that it was subjected to violence may be divided into the two following sections :—(i) The evidence that is obtainable previous to the performance of the act of respiration, and (ii) that which is obtainable afterwards. The evidence obtainable after the act of respiration has been performed will be first considered. Proof of the act of respiration certainly furnishes the strongest evidence of a child having lived at or about the time of its birth, but it does not necessarily prove that the child was born alive, since it may have breathed and have perished, naturally or otherwise, previous to its entire delivery from the body of the mother. It was at one time assumed that, if the lungs contained no air, the child could not have breathed, and must have been born dead. Such, however, is not the case, since a child may live after its birth for several hours, breathing feebly all the time, and yet there may be no evidence of its having lived from the state of the lungs, none of the air-cells presenting any visible distension; the absence of air from the lungs does not, therefore, prove that respiration has not occurred, nor does it prove that the child was dead at its birth. In such a case evidence of the child having lived must be searched for elsewhere.

TABLE SHOWING THE PRINCIPAL DEVELOPMENTAL CHANGES IN THE FŒTUS

Months	Length in inches	Weight in pounds	Eyelids	Pupillary membrane	Nails	Testicles	Centres of ossification
6	9-12	1-2	Ad- herent	Present	Just forming	In abdominal cavity, immediately below kidneys	Manubrium. Os cal- cis. Bodies and laminae of sacral vertebrae
7	12-15	2-4	Not ad- herent	Beginning to dis- appear	Finger - nails not reached extremi- ties of fingers	Near the abdominal rings	First piece of body of sternum. Astra- galus
8	15-18	4-5	Not ad- herent	Dis- appeared	Reached extremi- ties of fingers, and nearly extremi- ties of toes	In inguinal canals, or upper part of scrotum, especially the left testicle	Second piece of body of sternum
9	18-20	5-8 Aver- age 6½	Not ad- herent	Dis- appeared	Project beyond tips of fingers, and reach ends of toes	In scrotum	Lower epiphysis of femur. Third piece of body of sternum. Cuboid. First coc- cygeal vertebra

PROOFS DERIVED FROM THE ORGANS OF RESPIRATION
THAT THE CHILD HAS BREATHED

The thorax.—If breathing has occurred, the capacity of the thorax is increased, and it is more vaulted in appearance. These changes are, however, of no use in furnishing proof of the act of respiration, on account of the variations in the size of the thorax in different children at birth.

The position of the diaphragm.—The diaphragm is considerably more depressed after respiration has been established than before, owing to the increase in the volume of the lungs causing it to be pressed downwards. In infants born dead the highest part of the arch usually reaches to a level between the fourth and fifth ribs; in children who have fully respired, it usually descends to a level between the sixth and seventh ribs. The position of the diaphragm is, however, only of use in furnishing proof of the act of respiration in well-marked cases; in doubtful cases it is of but little use. Moreover the diaphragm has been found nearly as high in cases in which respiration has fully occurred as in cases in which no respiration has happened; and this is especially likely to be the case if gases of putrefaction have formed to any considerable extent within the abdomen.

The lungs.—The condition of the lungs should be most carefully and thoroughly investigated, the attention being directed to their *volume*, *colour*, the *development of the air-cells*, their *consistence*, their *weight* and *specific gravity*.

I. *The volume of the lungs.*—This should be noticed on opening the thorax. **If the child has not breathed**, the lungs will be invisible until the heart and thymus gland have been drawn to one side; the thymus gland occupies the upper portion of the thoracic cavity, and the heart the lower portion. The lungs are situated in the back part of the chest, their anterior borders reaching forward to about one-third of the length of the ribs.

If respiration has fully occurred, the volume of the lungs is considerably increased, so that they project forward to the front

of the chest, and partially cover the heart so as almost to conceal it. This condition of the lungs after the establishment of full respiration is easily recognised; but in cases where the infant has breathed feebly for a short time after birth, the volume of the lungs may remain practically the same as in the foetal condition; in such cases the volume of the lungs furnishes no reliable information.

II. *The colour of the lungs.*—**Before respiration has occurred** the lungs are of a pale brown or brownish-red colour, which somewhat resembles the colour of the liver, only it is paler. The colour should be observed immediately the thoracic cavity is opened, as exposure to the air causes it to change. Another marked peculiarity of foetal lung is that the surface is not mottled; the posterior portion of the lung may be slightly darker than the anterior, but otherwise the colour is uniform over the entire surface.

After full respiration the lungs assume a light red colour, which may vary in shade, or may consist of light red patches on a bluish-red ground; this mottled appearance is very characteristic of the occurrence of respiration, and is not presented by foetal lung. If imperfectly established, it is most noticeable on the margins and anterior surfaces of the lungs.

III. *The distension of the air-cells of the lungs.*—The presence of inflated pulmonary alveoli is a sure sign that air has entered the lungs. If only feeble respiration has occurred, the inflated alveoli may be dispersed as bright red spots on the brownish ground of the portion of the lungs which has not received air. The spots are polygonal in outline, and are not perceptibly raised above the surface. They may be seen with a lens of low magnifying power, or even by the unaided eye. Their presence proves either the occurrence of natural respiration or the introduction of air into the lungs by artificial means. Occasionally they may be absent when children have survived birth for a short time and have breathed very feebly.

IV. *The consistence of the lungs.*—**Before respiration** has occurred the lungs are uniformly compact and firm; they feel

in consistence somewhat like the liver ; they do not crepitate when pressed between the fingers ; when squeezed under water no bubbles of air escape. The foetal lung cuts like liver, and on pressure only a little blood appears here and there on the cut surface.

After respiration, and provided air has entered the alveoli, the lungs are spongy and elastic ; they crepitate when pressed between the fingers ; when squeezed under water bubbles of air escape. Lungs containing air cut less easily than foetal lung, and produce a crepitant sound as the incision is made ; blood-stained froth exudes from the cut surface when it is pressed and scraped with the blade of the knife.

V. *The absolute weight of the lungs*.—Previous to the occurrence of respiration the absolute weight of the lungs is less than afterwards, owing to the increased quantity of blood that passes into them in connection with the respiratory act. The so-called *static test* was based upon this difference in the weight of the lungs before and after the occurrence of respiration, as it was thought that a comparison of the weight of the lungs in an unknown case, with certain averages, might aid in the decision of the question as to whether respiration had or had not been performed. The static test, however, is useless as a means of determining the occurrence or not of respiration, as the weight of the foetal lungs is a varying amount, and no useful average weight can be struck.

Ploucquet's test was based on the assumption that there is a certain fixed relation between the weight of the lungs and the weight of the body of a new-born child ; it consisted in comparing the absolute weight of the lungs with that of the body of the child. There is, however, no definite relation between the weight of the lungs and the weight of the body of a child ; the test is based upon a fallacy, and is entirely useless as a test of the occurrence or not of respiration.

VI. *The specific gravity of the lungs*.—The specific gravity of the lungs is less after respiration has occurred ; the specific gravity of foetal lung varies from 1·04 to 1·05, whilst the specific

gravity of the lungs after full respiration is about 0.94. Foetal lung therefore sinks in water, whilst lung containing air floats. It is true that after the occurrence of respiration the lungs become absolutely heavier, owing to the increased quantity of blood that passes into them—during foetal life the lungs only receive the small quantity of blood that is required for their nutrition, but after the establishment of respiration the whole of the blood in the body passes through the lungs. Although the lungs thus become absolutely heavier after the occurrence of respiration, yet the air that is introduced more than counteracts the increased weight due to the increased quantity of blood, so that after respiration the specific gravity of the lungs is less than before. It is upon this property that the **hydrostatic test** is founded, the test consisting in ascertaining whether the lungs, both in their entirety and when divided into several portions, sink or float in water.

Mode of performing the hydrostatic test.—The lungs should be removed from the chest together, by cutting through the trachea just above its bifurcation, and should then be placed in a vessel containing tap-water or distilled water, at the ordinary temperature. If they float readily, the indication is that they are well charged with air, and that respiration had been fully established; if they float almost or quite submerged, the indication is that they probably have been only partially aerated. The bronchi should then be divided, and each lung tried separately, in order to determine if each be equally buoyant. Each lung should then be cut up into about twelve or fifteen pieces, and the flotation or not of each piece should be tested separately. If they float, they are to be taken out of the water and subjected to firm compression by wrapping them in a cloth, which is placed upon the floor, and covered over with a board; the operator should then stand (not jump) upon the board so as to apply a regular and even pressure to the different portions. After they have been submitted to this compression, the pieces of lung should be again placed in water to determine whether they now sink or float. The object of employing this amount

of pressure to the lungs is, that if their flotation be due to the development of gases of putrefaction, such gases would be readily expelled by compression, and the portions of lung would subsequently sink; whereas if air has entered the lungs from respiration, no degree of compression short of causing absolute disintegration of the lung-tissue will expel it, so that the portions of lung will still float when placed in water. The reason why the air which has entered the pulmonary alveoli is not capable of expression by such means is that the compression occludes the bronchioles, and so the air is pent up in the alveoli; the pressure cannot consequently expel the air, unless sufficient force be used to rupture the walls of the alveoli. If the lungs, when entire and when divided into pieces, sink, the inference is that there is no evidence of the child having breathed, although it is possible that it may have survived its birth for a short time.

Objections to the hydrostatic test.—Considering the importance that is attached to this test, it becomes necessary to inquire what are the objections that may be raised to it. This involves the consideration of the two following questions:—(a) Are there any conditions of the lungs of children, who have breathed, which may cause the lungs to sink in water? (b) Are there any conditions of the lungs of children, who have not breathed, which may cause the lungs to float?

(a) *Conditions that may cause the lungs of children, who have breathed, to sink in water*

Disease of the lungs, such as pneumonia, œdema, and pulmonary hæmorrhage, may increase the density of the pulmonary tissue, and so cause it to sink in water. **Atelectasis**, or imperfect expansion of the lungs from defective performance of respiration, may be another cause. **Complete non-expansion** of the lungs, although the child may have lived and breathed for hours, or even for days, may be the cause of the sinking. Taylor and Stevenson record a case in which the lungs sank in water, both

entire as well as when divided, although the child had survived its birth at least four days. It may seem anomalous that a child could live and breathe for hours, and even for days, without any indication of the occurrence of respiration in the lungs after death. Three explanations of this occurrence have been put forward. One is, that in such cases where the breathing is very feeble the air does not enter the pulmonary alveoli at all, but that the necessary interchange of oxygen and carbon dioxide takes place through the lining membrane of the trachea and bronchi; it is quite possible that this is the correct explanation, as the demand for oxygen in infants carrying on such a feeble existence must be very small. A second theory is, that in such children the passive elasticity of the lung-tissue drives out in expiration all the air drawn in at inspiration, so that the lungs, after having breathed, return to the foetal condition. This view is doubtless incorrect, as Hermann¹ has shown that the elastic recoil of the lung that has once contained air is powerless to expel all the air and to restore the lung to the foetal condition. A third explanation is, that the air which has entered the lungs may be entirely absorbed after cessation of respiration by the blood circulating through them.

It is therefore clear that, because the lungs sink in water, the assumption must not necessarily be made that the child was born dead. The sinking in water, under the conditions mentioned, of the lungs of children that have breathed has been considered by some medical jurists to constitute a serious objection to the hydrostatic test. This view, however, is based upon an incomplete conception of the value of the test; to quote Taylor and Stevenson, 'it is difficult to understand how such cases can affect the general application of the test, or why, because signs of respiration do not always exist in the lungs of children that have lived, we are not to rely upon them when they are actually found.' At all events, if the assumption be made, that because the lungs of a child sink in water it was

¹ Pflüger's *Archiv.*, 1879.

born dead, such an assumption, though it may be a wrong one, is not likely to implicate an innocent person, though it may lead to the acquittal of the guilty.

(b) *Conditions that may cause the lungs of children, who have not breathed, to float.*

The development of the gases of putrefaction in the lungs may cause them to float, although such lungs may never have been aerated. The lungs belong to the class of organs which putrefy slowly, and although the exact period when the foetal lungs undergo putrefaction cannot be fixed, yet it is delayed much longer in them than in the other organs of the infant. If, therefore, the other organs give no signs of decomposition, or only incipient signs, it may be taken that the flotation of the lungs is not due to putrefactive changes. If the lungs float from the development of the gases of putrefaction, the condition would be recognised by the presence of more advanced putrefaction in other parts of the body, by the dark green colour and offensive odour of the lungs, and by the fact that the gases do not collect in the alveoli, but in vesicles situated between the lung-substance and the pleura, at the free borders of the lobes, between the lobes, and at the base of the lungs; later on, the deeper-seated tissues of the lungs become infiltrated with gases. The subpleural vesicles vary in size, from that of a pin's head to that of a bean. A putrescent lung which owes its buoyancy solely to the gases of putrefaction does not crepitate when cut. From such lungs the gases are readily expelled by pressure, so that pieces of the lung which floated previous to expression sink afterwards. It should be borne in mind that a similar result occurs after expression in the case of lungs that have breathed, and that also contain the gases of putrefaction owing to the softening of the lung-substance by the putrefactive processes. If, therefore, the lungs are in a state of advanced putrefaction, it is impossible to obtain satisfactory evidence, as to whether they have breathed, by the hydrostatic test. Medical evidence can then neither give

an affirmative nor a negative answer to the question of the occurrence of respiration; since, however, the lungs putrefy slowly, the employment of the hydrostatic test should not be omitted simply because the body is in an advanced stage of external putrefaction.

Artificial inflation may cause the lungs of children, who have not breathed, to float. Artificial inflation is seldom produced, but it may be performed by the direct application of the operator's mouth to that of the child, or by forcing air through a catheter or other tube passed by the mouth into the trachea, or by the method known as Schultze's swinging. Artificial inflation is very difficult to effect, as the air is more likely to pass down the œsophagus into the stomach than into the lungs. Moreover it is only likely to be attempted or performed under one of the three following conditions:—(i) When a medical man employs it in the endeavour to restore a still-born child; the performance of artificial inflation will then be known. (ii) When performed by a mother with the object of attempting to save or restore the child's life; such an act would be incompatible with infanticide or attempted infanticide. (iii) When performed by some malicious person with the object of making the lungs of a dead child appear like those of one who had breathed, so as to involve another person in a criminal charge; such an action is most unlikely, as it would involve on the part of such a malicious person a knowledge of the physical properties of foetal and aerated lungs.

If artificial inflation be successful, the lungs present different characters to those of lungs that have breathed. The alveoli on the surface of the lungs are frequently ruptured; there is an absence of the mottled condition seen in aerated lungs; whilst no amount of compression, short of complete disintegration of tissue, will prevent the floating of lungs that have breathed, firm compression in a folded cloth of lung that has been artificially inflated not unfrequently expels the air and causes it to sink. This removal of the air by pressure can be effected if it has not penetrated beyond the bronchioles, or if it has been

introduced with sufficient force to rupture the walls of the alveoli and the inter-alveolar tissue, and to gain access to the sub-pleural connective tissue. If, however, the air be introduced by artificial inflation into the alveoli without rupturing their walls, then no amount of pressure, short of actual destruction of the lung tissue, would cause the lung to sink in water. Several cases have been recorded in which the lungs of still-born children, inflated by means of Schultze's swinging, have acquired all the properties of lungs that have partially breathed in the natural way. Cases have also been described in which blood-stained froth has been obtained by the incision of artificially inflated lungs. Artificial inflation does not increase the actual weight of the lungs, as respiration does, since blood is not directed into the lungs by the act of inflation.

Conclusions as to the value of the hydrostatic test.—From the various facts that have been described, the following conclusions may be drawn:—I. The hydrostatic test is not a test that necessarily shows that a child has been born alive; it is a test of respiration, but it does not show whether the respiration occurred only during birth, or afterwards. Thus a child may breathe while within the uterus, or while the head is within the vagina, or while the head is projecting from the vagina. In most cases that have occurred of respiration on the part of the child whilst completely within the mother, the admission of air has been facilitated by the separation of the vaginal walls by the hand of the accoucheur or by the employment of instruments, so that free communication between the external air and the child's mouth has been established. M'Lean¹ records the case of a child that cried for four or five minutes before it was born—'the voice sounding as if coming from the cellar.' It is just possible that air could find admission to the child's mouth, when it is within the uterus or vagina, without artificial separation of the vaginal walls. The killing of children during birth is not child-murder, as the law requires proof that the child must be entirely in the world in a living state to

¹ *American Jour. of Obstetrics*, 1889.

be the subject of murder. As under normal conditions it requires two or three days of breathing to fully dilate the pulmonary alveoli, and weakly children require a still longer time, it follows that during the short time a child may occasionally breathe prior to its complete expulsion from the body of the mother, the accomplishment of complete expansion of the lungs is impossible. If, therefore, the lungs are found completely expanded, it is presumptive evidence that the child was fully born alive.

II. The lungs of children that have not breathed may float in water from the development of the gases of putrefaction, or from artificial inflation. The gases of putrefaction are readily expelled by compression, so that the lungs subsequently sink in water. Artificial inflation is not easy, but, when it has been performed, the air can generally be expelled by firm compression of portions of the lungs, so as to cause them to sink.

III. When lungs have undergone perfect respiration the air cannot be expelled from them by pressure, so as to cause them to sink in water, unless the force used be sufficient to completely disintegrate the lung-tissue.

IV. The lungs of children, that have lived and breathed after birth, may sink in water, either from their density being increased by disease, or from their not having received sufficient air to enable them to float.

V. A child may survive its birth and breathe freely for hours and even for days, although at the post-mortem examination no part of its lungs may show evidence of having been penetrated by air.

FURTHER PROOFS THAT THE CHILD HAS BREATHED

The presence of air in the stomach and intestines.—This is known as Breslau's 'second life-test'; it is a valuable adjunct to the hydrostatic test, and is based upon the facts that the stomach and intestines of still-born children sink in water, whereas in children who have lived and respired the stomach,

and generally the stomach and duodenum together, contain sufficient air to enable them to float on water. The air is probably swallowed during the first respirations, which are accompanied by gasping and crying. If the child die after the first few respirations, the air only passes as far as the stomach, rendering that viscus buoyant; but if the breathing be kept up for some time, the air passes as well into the duodenum, and subsequently into the lower part of the intestines. The method of performing this test is to place double ligatures at the cardiac and pyloric ends of the stomach, and also at the lower part of the duodenum. The stomach and duodenum are then detached together and placed in water to observe whether they float or not; they are then separated from one another, and the buoyancy of either viscus is tested. The air that indicates live birth is closely incorporated with the contents of the stomach, so as to form a froth. The lower in the intestines that air is found, the longer in all probability has the child lived, and the more certain is the evidence of live birth.

Breslau's test may be rendered untrustworthy by the introduction of air into the stomach by attempts at artificial inflation, or by the development of gases of putrefaction within the stomach. In the absence of these two conditions the floating of the stomach and duodenum affords strong evidence that the child had breathed; the converse of this—viz. the sinking of the stomach and duodenum—does not furnish proof that the child was still-born. Stevenson¹ relates an exception to the non-buoyancy of the stomach of still-born children, which shows that implicit reliance must not be placed on Breslau's test as a proof of live birth. He examined the body of an acephalous foetus sent to him from the country. The accoucheur, perceiving that a monster was about to be born, had grasped the neck whilst the head of the foetus was still within the vagina, and thus effectually prevented respiration. The body, when examined, showed no signs whatever of putrefaction, nor could

¹ *Guy's Hosp. Repts.*, 1893.

any sign of respiration be discovered in the lungs. The stomach and duodenum were secured by double ligatures, and those organs as a whole sank in water. The ligatured stomach, however, was buoyant, and readily floated in water until an incision was made in it. The gas which escaped was odourless, and the other contents of the viscus were the ordinary mucoid semi-fluid matter found in the stomachs of new-born children.

The middle ear test.—The middle ear of the foetus is filled with an embryonic gelatinous mass. Wreden has pointed out that this mass is replaced by air when respiration has fully taken place, so that the presence of a distinct cavity in the middle ear forms an important fact in determining whether a child has survived its birth. Stevenson has found this test useful in several cases. Ogston¹ found that the embryonic mass disappeared in from a few hours to two or three weeks after birth. Lesser² states that a few respirations produce little effect on the contents of the middle ear, but that after respiration for several hours the contents are displaced by air. On the other hand, Schmaltz³ states that the mass may commence to disappear during foetal life, and that, although respiration has a distinct influence on it, yet the absence of the mass is not a certain proof of the occurrence of respiration; he has found the mass in infants that had breathed, and occasionally it was absent in the foetal state.

3. EVIDENCES AS TO WHETHER THE INFANT WAS BORN ALIVE, AND, IF SO, THE PERIOD OF TIME WHICH HAS ELAPSED SINCE ITS DEATH.

The term 'born alive,' in the legal sense, means the complete expulsion of a living child from the mother. As long as any part of the child is retained within the vagina or vulva, it is not legally 'born.' Anomalous as it may seem, the destruction of a living child, while only partially expelled from the

¹ *Brit. and For. Med. Chirurg. Rev.*, 1875.

² *Vierteljahrsschr. f. ger. Med.*, 1879. ³ *Arch. f. Heilkund.*, 1877.

body of the mother, is not regarded as murder. In order for a child to be legally 'born alive,' it is not necessary that the umbilical cord should be cut.

Respiration is only one of the proofs of life, and in the absence of any satisfactory evidence that can be obtained from the state of the lungs, other kinds of evidence that would show that a child had lived would be received, provided such evidence is of a satisfactory nature. That evidence of life in a child prior to the establishment of respiration is admissible, is shown in the charge of Coltman J., in the case of *Rex v. Sellis* (Norfolk Spr. Circ., 1837), in which the prisoner was charged with murdering her child by cutting off its head. The judge directed the jury that, if the child was alive at the time of the act, it was not necessary that it should have breathed in order to constitute murder.

It must be admitted that there are no satisfactory evidences of life before respiration that can be discovered in the dead body which would, at all events, justify the expression of a positive opinion in such cases. The presence of marks of great violence upon the body, or the evidence of witnesses that respiration had been designedly prevented after the complete birth of the child, might afford presumptive evidence of murder, but would require to be supported by very strong circumstantial evidence to lead to a conviction.

EVIDENCE FROM CHANGES IN THE BODY

The presence of warmth or of cadaveric rigidity in the body of an infant would not demonstrate that it had been born alive. Such indications would merely show that the child had been recently living.

Changes in the umbilical cord.—The desiccation and separation of the cord, with the signs of localised inflammation and subsequent cicatrisation, afford positive proof not only that the child was born alive, but that it continued to live for some time after its birth. The cord is usually of a bluish, pearly-

white colour at birth, but within twelve to twenty-four hours it loses its polish, and becomes dry and flaccid. The process of desiccation commences at the free end, and gradually advances towards the point of insertion. At the end of twenty-four hours it has generally reached to within half an inch of the umbilicus, the proximal portion still remaining pulpy, and of an amber colour. About the third or fourth day, the desiccation of the cord is completed. By this time the cord is flattened and twisted, presenting a parchment-like, translucent appearance, the arteries and veins appearing as red lines. About twenty-four hours after birth a ring of inflammation forms at the junction of the cord with the abdominal wall, the inflammation is succeeded by suppuration, and about the fourth or fifth day the cord separates by ulceration close to the abdominal wall. Occasionally the separation may take place some days later, as the feebler the child the longer the process of detachment. An inflammatory zone surrounds the point of separation, and persists for some time after detachment. Cicatrisation of the navel is usually completed in about eight to twelve days. The existence of a true inflammatory zone about the umbilicus is an important sign of an infant having lived after its birth. It should not, however, be confounded with a red line which at birth surrounds the insertion of the cord, and which is simply a coloured ring without any signs of inflammation or swelling.

The spontaneous separation of the cord is a vital act, and can only occur in a living child; but desiccation of the cord may take place in a dead child, although the process occupies a much longer time in the latter. In such a case the cord dries up, but remains attached, as spontaneous separation never occurs in a still-born child.

Changes in the skin.—The colour of the skin is of no value as an indication of a child having survived its birth. About the first or second day after birth the cuticle begins to scale off, either in layers or as a dust. The desquamation lasts for one or two weeks or more. This exfoliation of the cuticle is a vital

phenomenon, and is therefore a clear proof that the child has survived its birth.

Evidences from the state of the abdominal organs.—The discovery in the stomach or intestines of articles of food, such as milk, sugar, or starchy substances, would be good evidence of live birth. The importance of ascertaining whether the stomach or intestine floats in water from the presence of swallowed air has been already dealt with (see p. 204). The absence of meconium from the intestines does not necessarily prove that the child was born alive, since it may be discharged during the act of birth. As it can be so discharged, and as portions may remain on the surface of the body of the child, the mere presence of stains of meconium on the clothing of the child would not furnish proof that the child had been born alive. Meconium may be recognised by its dirty, dark-green colour and want of faecal odour. Under the microscope it is seen to consist of mucous corpuscles and epithelium, small crystals of bilirubin and biliverdin, cholesterin crystals, fat globules, and crystals of stearic acid.

The foetal liver is, relatively, enormously large, on account of its important function in connection with the circulation of the blood. The weight of the liver is, however, of no use as a means of ascertaining whether the child lived after its birth or not.

The absence of urine from the bladder does not necessarily prove that the child was born alive, since the bladder may be emptied during the act of birth.

The condition of the heart and foetal vessels.—It has been supposed that the condition of the foramen ovale, ductus arteriosus, and ductus venosus would be of use in deciding whether a child had or had not survived its birth. The processes by which these parts of the foetal circulation are closed do not commence till several days have elapsed after birth; they may take weeks to accomplish, and they do not follow any definite order. These changes in the foetal circulation are

therefore of no value to the medical jurist in determining whether the child was born alive or not.

Injuries and marks of violence.—The presence of these may be of some use in deciding whether a child survived its birth, especially if the injuries are on different and remote parts of the body, and provided they present the characters of injuries produced during life.

4. CAUSES OF DEATH OF THE NEW-BORN CHILD

The infantile mortality amongst illegitimate children is about twice as high as that of legitimate children, the average infantile mortality of the two classes, taken from several parts of England and Scotland, being 177 per 1,000 of legitimate births, and 348 per 1,000 of illegitimate births.

In endeavouring to ascertain the cause of death of a new-born child, the attention of the medical examiner must be directed to the elucidation of whether death was due to natural or accidental causes, or whether it was the result of the infliction of criminal violence.

(A) DEATH FROM NATURAL OR ACCIDENTAL CAUSES

I. Compression of or by the umbilical cord.—If prolapse of the cord occur, and if the prolapsed part be subjected to continuous pressure sufficient to interrupt the blood current, then the death of the infant may occur. Such compression may happen in breech or foot presentations, or if prolapse of the cord occur in head presentations; if the cord be not quickly relieved of the pressure, the child dies. Death under these circumstances is due to *suffocation*; owing to arrest of the circulation of oxygenated blood through the cord, the foetal blood becomes venous, and in this condition exercises a stimulating action on the respiratory centres; attempts at respiration are consequently made, but, owing to access of air being prevented, suffocation occurs. The signs of suffocation will be found in death from such a cause, viz: distension of the heart

with blood, injection of the mucous membrane of the trachea, and the presence of blood-stained mucus and particles of vernix caseosa in the air-passages. Owing to the meconium usually being voided during the attempts at respiration, it is found on the surface of the child's body, and may even be found in the air-passages, having been drawn in during the respiratory attempts. The discovery of vernix caseosa in the bronchial tubes affords strong evidence in favour of intra-uterine suffocation. The simplest way of detecting it is, according to Dixon Mann,¹ to take a little of the contents of a bronchial tube spread on a cover-glass, dry it over a bunsen-flame, and stain in a solution composed of one drop of a one per cent. solution of gentian-violet to a watch-glass of water; the cover-glass is allowed to remain in the solution for five minutes, and is then washed with alcohol, and cleared with oil of cloves. The stain is taken by the particles of vernix caseosa, and their presence is then easily detected.

Not unfrequently the child's neck is surrounded by the umbilical cord, so that death from *accidental strangulation* may occur. The cord is found in this position in about 25 per cent. of deliveries, and the mortality is estimated at from 1.1 per cent. to 2.7 per cent. The effects of constriction of the neck by the umbilical cord are not similar in all respects to those of ordinary strangulation, in that death takes place previous to the occurrence of respiration. Although the cord is composed of soft materials, yet cases have been recorded where it has left very positive marks upon the neck of the child; the furrow or groove is rounded in transverse section, and may be of a red or blue colour, but what is most important is that the skin is not abraded, whereas such an abrasion is frequently observed in cases of strangulation by an ordinary cord or rough string. There may be two or three parallel grooves if the umbilical cord has been wound two or three times round the child's neck.

¹ *Forensic Med. and Toxicol.*

It is possible for the foetal membranes to get twisted round the child's neck so as to leave a mark. A broad and somewhat ill-defined mark may be produced by contraction of the cervix around the neck of the child after the head has passed the os uteri. Occasionally, marks, resembling those produced by the umbilical cord, may be caused by forcible flexion of the head during labour; such marks are especially likely to occur in fat children.

II. Protracted delivery.—This is not unfrequently the cause of the child's death, especially in first labours; a child, particularly if feeble and delicate, may die from exhaustion during a protracted labour before respiration is established. If the force exerted by a powerfully contracted uterus be continued for long after the rupture of the membranes, it not only will probably kill the child, but may produce various traumatic effects, which might be mistaken for those of criminal violence; this is not to be wondered at when the soft and delicate nature of the tissues of an infant are taken into consideration. Monteith¹ relates the case of a child born with a depressed fracture of the skull about the middle of the right parietal bone, the fracture extending to the sagittal suture on one side, and to the coronal suture on the other. Effusion of blood into the cranial or abdominal cavities has also been known to occur when the death of a child results from protracted labour. According to Taylor and Stevenson, death from protracted delivery may be suspected when there is a large caput succedaneum on the head of the child, and the head itself is deformed or elongated as a result of long-continued pressure; or if there be an effusion of blood beneath the pericranium, accompanied by a congested state of the vessels of the brain.

III. Debility from malnutrition in utero, or from immaturity. A feeble child may be born either prematurely or at full term, and a very slight cause may be sufficient to determine its

¹ *The Lancet*, 1874.

death. Such a case would be recognised by the immature condition of the body, and by the absence of other causes of death.

IV. **Hæmorrhage from the cord.**—Death occasionally occurs from this cause either from accidental rupture of the cord during birth, or after its severance. The hæmorrhage may be due to the cord being improperly ligatured, or it may be the result of criminal design. Fatal hæmorrhage is less apt to follow a rupture of the cord than when it is cut, owing to torsion of the vessels being more likely to occur in the former case, and so lead to arrest of the bleeding. Many cases have been recorded where from rapid delivery in the upright position the child has suddenly fallen to the ground, thus causing rupture of the cord, but without hæmorrhage of any consequence following. The rupture usually occurs a few inches from the umbilicus. In cases of death from hæmorrhage of the cord, the child presents a blanched and a waxy appearance, and there is a similar bloodless condition of the internal organs; these appearances, however, do not hold good if putrefaction is advanced in the body.

V. **Fractures.**—These are chiefly confined to the bones of the head. Such fractures, as well as those of any of the other bones, may be due to injuries received by the mother during the period of gestation; in the majority of such cases, however, the child dies at the time of the infliction of the injury, and is born prematurely, so that the question of infanticide is not likely to arise.

Owing to the mobility of the cranial bones when subjected to pressure, the occurrence of fractures of the skull-bones during labour is very rare. Such fractures may, however, occur accidentally from excessive size of the child's head, or from deformity of the mother's pelvis, or from the employment of instruments to aid delivery. In these cases, as the child may be born living and may live long enough to breathe, it is important to be able to prove that the injury was accidental, and not criminal. If due to accident, the fracture is usually

confined to the parietal bones; occasionally the frontal bone may be fractured, but never the occipital bone; the fracture is generally a mere crack or slight fissure. In cases of criminal violence, there are generally marks of injury on the scalp, with depressed fracture of the affected bone or bones; but it should be borne in mind that extensive fractures of the child's skull may be caused by criminal violence, without the scalp being visibly injured.

Fractures of the skull bones may result from the child falling head downwards on to a hard surface, owing to the occurrence of a sudden delivery while the mother is in the upright position. Such cases, or such alleged cases, present great difficulty to the medical jurist, as there are no special characters to distinguish them from cases of criminal violence. In these instances the fracture is generally limited to the parietal bones, and if only one be broken, it is usually the left, on account of the rotation of the child during its passage through the pelvis; the fractures may, however, involve the frontal or the occipital bones. The mistake should not be made of confounding defective ossification of the skull bones with fractures. In the former case, which usually occurs in the parietal bones, the edges are thin and smooth, and exhibit no marks of injury; in the case of a fracture the edges are jagged and blood-stained, and there is some effusion of blood in the neighbourhood of the fracture.

VI. Accidental asphyxia.—Death may occur from this cause owing to a woman when in labour going to a commode, water-closet, or privy to relieve the bowels, and a sudden delivery then causing the precipitation of the child into the fluid in the receptacle or into the discharged liquor amnii; if not removed at once, death may occur from asphyxia. This is a common explanation of the cause of death that is given in cases of alleged infanticide, and the reason for the non-removal of the child at once from the receptacle is further explained by the mother becoming unconscious at the moment of delivery. The occurrence of sudden unconsciousness during delivery under

such circumstances is naturally regarded with suspicion, and such suspicion becomes stronger when it is alleged to have occurred under these conditions in the case of an unmarried primiparous woman. It is, however, but just to concede the possibility of such an occurrence, as authenticated cases have been recorded of rapid delivery succeeded at once by insensibility. An instructive case of this kind, recorded by Pullmann, is narrated by Dixon Mann.¹ 'A married lady of good position, who anticipated with much pleasure the expected birth of a child, had some pains in the back, but did not regard them as labour pains. An hour or two after, bearing-down pains began, and the membranes ruptured; the doctor and nurse were immediately sent for. Meanwhile the patient felt a strong desire to urinate, and got out of bed to pass water. She placed herself on the vessel, but feeling a peculiar quick movement in the genital organs, she sprang up, and at the same moment the child fell into the vessel, the placenta following. The mother immediately lost consciousness, and if the nurse at that moment had not entered and removed the child from its perilous position—head downwards in the vessel—it would undoubtedly have died. The child was about the thirty-first week of development; there was no caput succedaneum. The mother had an extensive rupture of the perineum in consequence of the quick expulsion. If this had occurred to a servant-girl, and in obedience to her desire to urinate she had gone to the closet, the child would have been dead long before she had recovered her senses, but her account of the event would probably have been regarded as a pure fabrication.'

VII. Congenital malformation and disease.—Any congenital malformation of the child, and disease, whether congenital or occurring during gestation, may be the cause of the child's death.

¹ *Forensic Med. and Toxicol.*

(B) DEATH FROM CRIMINAL VIOLENCE

I. Death from some form of asphyxia criminally produced.—

The various forms of asphyxia constitute the commonest means of the criminal destruction of new-born children. Tardieu, who examined 555 cases of infanticide, found that death in four-fifths of the cases was due to some form of asphyxia. His cases are tabulated thus:—

MODES OF INFANTICIDE (TARDIEU)

Suffocation	281	(Asphyxia) 444
Immersion in privies	72	
Strangulation	60	
Drowning	31	
Fracture of skull	70	
Neglect	14	
Burns	8	
Wounds	8	
Hæmorrhage from cord	6	
Exposure to cold	3	
Poisoning	2	
Total	555	

Asphyxia may be produced by suffocation, strangulation, drowning and hanging; two varieties of suffocation that may be employed are smothering and the forcing of various substances into the mouth and nose.

Suffocation is the commonest mode of committing infanticide, as may be seen by reference to Tardieu's table. Only very slight pressure of the hand, a cloth or other substance, to the mouth and nostrils of a new-born infant is sufficient to cause suffocation; but, as more violence is frequently used than is necessary, and as the soft tissues of the child readily show the effects of such excessive violence, it is not uncommon to find about the body of the child some evidence of the employment of criminal violence. On the other hand, it should be borne in mind that accidental suffocation is a frequent cause of death

in new-born children. Such children may be accidentally suffocated by the head and face not being disengaged in time from the membranes or caul, or from pressure exerted on the chest by the vagina after the head has been born and breathing has commenced, or from the air-passages becoming obstructed with foreign matters, such as mucus, blood, meconium, fæces, or from the bed-clothes accidentally covering the face. Such cases of accidental suffocation are especially apt to occur when the woman has been delivered alone, and without any assistance.

Criminal suffocation of infants is frequently resorted to, on account of the ease with which it can be accomplished, and the probability, if too much violence has not been used, of its not being distinguishable from an accident. A new-born infant is readily suffocated by the application of the hand, or of a folded cloth to the mouth and nostrils; the introduction of foreign bodies, such as tow, hay, feathers, ashes, dough, and sand, or pressure on the child's chest, or simply leaving it under the bed-clothes, are means that have been employed for suffocating children. In connection with the last-mentioned mode of suffocation, no marks of violence would be left on the body; but it should be remembered that the child may, under the conditions, have been accidentally suffocated, from the mother being unable to remove the child from under the clothes in time to save its life. Careful examination of the air-passages for foreign bodies should always be made.

Strangulation is a frequent mode of child-murder. As more violence is usually employed than is necessary, the neck is apt to bear the impress of the fingers, or of the ligature used, and if the latter be of rough material, the cuticle may be abraded; there may also be ecchymosis around the marks of the ligature. If strangulation has resulted from throttling, the marks produced by the pressure of the fingers and thumb may be visible; a single impression may be found on one side of the neck produced by the thumb-nail, and two or more on the other side produced by the finger-nails; the skin may be

scratched or excoriated in the neighbourhood of these impressions. On the other hand, it must be borne in mind that cases of death from throttling have occurred, and yet no external signs of injury have been visible; in such cases it is probable that the web between the thumb and index-finger of one of the assailant's hands was applied to the front of the throat of the victim. Although there may be no sign of injury externally, the deep structures may be infiltrated with blood, and the cartilages of the larynx may be fractured.

Marks somewhat similar to those produced by criminal violence may be caused by attempts on the part of the mother or midwife to accelerate a difficult labour, and a defence that is occasionally set up in cases of alleged infanticide is that a cord was placed around the neck of the child to aid its delivery. A still commoner explanation or defence is that strangulation was accidentally caused during delivery by the umbilical cord becoming twisted round the child's neck. If a piece of string, ribbon, or rope has been used to strangle the child, there will be a more or less distinct groove round, or partly round, the neck; the skin is generally abraded, and ecchymoses are usually to be seen at parts of the groove or at its edges, although not invariably so. If the umbilical cord be the constricting medium, the mark or groove may occasionally show the production of local ecchymoses, although it has been erroneously stated that such ecchymoses are not produced when the funis is the constricting medium. An important distinction, however, is that the soft and smooth umbilical cord does not produce abrasions of the skin; moreover, if death has occurred from strangulation by the funis, there will usually be an absence of the signs of respiration. The following case illustrates the fact that ecchymosed depressions may be produced by constriction of the neck by the umbilical cord. Taylor and Stevenson relate a case of a lady in labour with her first child:—'The labour was a lingering one, owing to the size of the head, and the child came into the world dead. The navel-string was found coiled three times round the neck, passing

under the right armpit, and upon removing it three parallel discoloured depressions were distinctly evident. These extended completely round the neck, and corresponded to the course taken by the coils. The child appeared as if it had been strangled. Had this child been born secretly, this state of the neck might have created a strong suspicion of homicidal violence. Strangulation after birth could not, however, have been alleged, because there would have been no proof of respiration.' It is possible, however, for the umbilical cord to encircle the neck of the child with sufficient force to arrest the circulation in the vessels of the funis, and yet for the constriction to be just insufficient to cause strangulation when the head only has been delivered; in this position the child might breathe, and upon the subsequent expulsion of it from the maternal parts the cord might become so tightened as to strangle the child. In such a case the neck would show signs of strangulation, and the lungs might show signs of having breathed. The following case, related by Dixon Mann,¹ illustrates the possibility of such an occurrence:—'A woman, aged twenty-one, with normal pelvis, was attended in labour by a midwife. The funis surrounded the child's neck too tightly to be removed, and the head was expelled, but the shoulders impeded further progress; a medical man arrived in five minutes and he tied and divided the funis. The child was delivered with considerable difficulty in a deeply asphyxiated condition, and only with prolonged efforts was it brought to life; a distinct strangulation mark ran round the neck. The child died eight hours after. At the necropsy a clot of blood was found under the pia mater flattening the cerebral convolutions; blood was also found in the lateral ventricles and at the base of the brain. Ecchymoses were present on the pleura and pericardium, and extravasation of blood under the mucous membrane of the larynx; the lungs were partially distended with air. In the absence of any history it would probably have

¹ *Forensic Med. and Toxicol.*

been assumed that the child was born alive and was afterwards strangled.'

Drowning.—This mode of death is seldom resorted to as a means of infanticide, although it is common for the child to be killed in some other way, and for its body to be thrown into a canal, river, or pond in order to get rid of it, or in the endeavour to conceal the actual manner of its death. The body of a well-nourished infant contains a large proportion of fat, and therefore does not readily sink. Infanticide by drowning has been perpetrated, as when a woman causes herself to be delivered in a bath, so as to retain the child under water, and thus prevent its breathing. There are no signs indicative of death from drowning in the body of a child that has not breathed; after respiration the signs are the same as in adults (see pp. 109–115). Drowning may be the result of accident, as when a woman in labour, desiring to evacuate the bowels, is suddenly delivered while seated on a chamber-vessel, water-closet, or privy, the child falling head first into the fluids of the vessel, and drowning before assistance is rendered. It should be borne in mind that intra-uterine maceration may possibly cause changes of the body resembling those produced by prolonged immersion in water.

II. Death caused by wounds and other injuries.—If the body of an infant be found with wounds or other injuries upon it, the following points will present themselves for solution: (i) Are the wounds or injuries ante-mortem or post-mortem? (ii) Did death result from the infliction of the wounds or injuries? (iii) Were the wounds or injuries accidental or criminal in their origin? For the methods of distinguishing ante-mortem and post-mortem wounds, see pp. 21 and 22.

Care should be taken not to mistake the caput succedaneum that forms on the head of a child during a protracted labour for the results of violence. This swelling is generally situated over one of the parietal bones. Externally there is no laceration or abrasion of the skin, but it is generally discoloured. Internally the swelling contains serum, or occasionally serum

mixed with blood; but usually there is no injury to the bones of the skull. If the swelling result from violence, this will generally be indicated externally by abrasions or lacerations of the skin, and internally by effusions of blood beneath the scalp, and possibly by fractures of some of the bones of the skull, and hæmorrhage within the skull.

In cases in which injuries of the skull of a dead infant are found, the defence generally is that the injuries were caused during delivery, owing either to a difficult labour causing compression and injury of the head, or to a very sudden labour causing projection of the child on to a hard surface. Although considerable compression of the head of a child may occur during delivery without causing fracture of the bones of the skull, yet it is well known that such fractures may occur during difficult and protracted labours, even without the employment of instruments or of manual interference. In cases of such injuries, the scalp does not, as a rule, present indications of abrasions or lacerations such as usually accompany the infliction of criminal violence applied to the head of an infant. If the defence be that the injuries were caused by a sudden labour when the woman was in the upright position, careful attention should be paid to the point of separation of the umbilical cord. This is generally, but not invariably, near the navel. The free end of the cord should be examined to see if it has been torn or cut.

If delivery occur while the mother is in the upright position, and the child be projected head foremost on to a hard surface, then the child's skull may certainly be fractured, although it is not necessarily so under these conditions. Extensive injuries of the skull are not likely to be produced by a fall during such a delivery, so that while the slighter injuries of the skull may be caused either accidentally or criminally, extensive injuries are indicative of homicide. Taylor and Stevenson mention a case of fracture of a child's skull owing to a woman being delivered in the erect posture. In this instance there was merely the appearance of a bruise on

the head, and the umbilical cord was ruptured three inches from the navel. The child did not, apparently, suffer from the fall, and continued well till six days after birth, when it was seized with convulsions and died. A fissure of about an inch and a half in length was found in the upper part of the left parietal bone, and a clot of blood was present between the bone and the dura mater beneath the fracture.

Occasionally the defence is made that the injuries to the skull were accidentally inflicted by the mother during her forcible endeavours to aid or expedite delivery. Although it is within the bounds of possibility that the skull might be fractured in this way, yet severe injuries of the skull are not compatible with such a mode of infliction. A fracture or fractures of the skull may be caused after death by the body of an infant being thrown over a wall and falling upon some hard substance, or by excessive violence employed in the act of concealing the body by burial. For the distinction of such post-mortem fractures from fractures inflicted during life, see p. 65. The problem, however, may be a very difficult one to solve, as injuries caused *immediately* after death do not appreciably differ from those inflicted during life.

The neck of an infant possesses a very considerable degree of mobility, but it should be borne in mind that, very exceptionally, the neck has been twisted during delivery to such an extent as to cause a displacement of one or more of the cervical vertebræ, and consequent death.

III. Death due to exposure and starvation—The new-born infant soon perishes if exposed, when insufficiently clothed, to cold, and when deprived of food. Entire deprivation of nourishment generally causes death in from two to three days, although cases have been recorded of infants surviving for three days without food. Infants not uncommonly die of chronic starvation, from having been fed on improper as well as scanty food when placed in charge of a baby-farmer. For the signs indicative of death from starvation, see p. 101.

IV. Death due to hæmorrhage from the umbilical cord.—This

may be the result of intentional neglect to tie the cord. The absence of a ligature is not a necessary indication that the cord was not tied, as the ligature may have been removed, or the funis may have separated at the site of the ligature.

V. Death caused by poisoning.—This mode of infanticide is very rare. It can be recognised by the methods previously described for the detection of death by poison.

MODE OF CONDUCTING THE POST-MORTEM EXAMINATION IN A CASE OF SUSPECTED INFANTICIDE

External examination.—A careful external inspection of the body of the child should first be made. Notes should be made of the presence or absence of body warmth, rigor mortis, signs of putrefaction, excessive pallor of the body, wounds, bruises, scratches, or injuries of any kind. The sex, length, weight of the body, position of the umbilicus, and the condition of the umbilical cord should be noted. Vernix caseosa should be looked for, as its presence indicates absence of the usual attentions at birth. The mouth and nostrils should be examined for foreign bodies. Marks about the neck, that may be indicative of strangulation, should be carefully examined, as well as the underlying tissues and structures.

Internal examination.—An incision should be made commencing at the middle of the lower jaw and passing straight down to the lower end of the sternum, whence an incision should be carried on either side to the anterior superior spine of the ilium; the triangular portion of the integuments thus shaped out is then turned back, and the condition of the umbilical vessels is observed. When the abdominal cavity is opened, the index-finger of the right hand is introduced, and its tip placed at the highest part of the arch of the diaphragm, where its position is determined by placing the index-finger of the left hand in a corresponding position externally; in this way the height of the diaphragm is ascertained. The thoracic cavity should then be opened by cutting through the costal

cartilages at their junction with the ribs, a pair of scissors being used preferably to a knife, and the general appearance of the contents of the thorax should be noted. The incision commenced at the middle of the lower jaw should be continued upwards so as to divide the integument over the chin and the lower lip; the symphysis should be vertically divided from above downwards by means of a pair of scissors, one blade of which is passed within the mouth. The soft structures are then separated and the two halves of the jaw well retracted, so as to yield an unobstructed view of the mouth and pharynx without displacing any foreign body that may be present. The lungs, stomach, and intestines are then removed, and, after noting their volume and general appearance, they are submitted respectively to the hydrostatic test and Breslau's test. All the viscera should be carefully examined, including the gall-bladder and urinary bladder, and the presence or absence of meconium in the large intestine should be ascertained; if poison be suspected, the contents of the stomach and intestines and the various viscera must be preserved for analysis. The scalp should be carefully examined for any punctures, and then reflected, and the fontanelles submitted to similar examination; the roof of the skull is removed by cutting through the bones with strong scissors, and the brain is submitted to careful inspection. Lastly, the stage of development of the child must be determined by observation of the particulars previously detailed (see p. 189). The existence of a centre of ossification in the lower end of the femur is ascertained by section of that bone, and its size is determined by cutting thin sections from the lower end of the bone until the maximum diameter of the ossific centre is reached.

CONCEALMENT OF BIRTH

The law (24 & 25 Vict. ch. 100, sec. 60) in connection with concealment of birth is thus expressed:—

‘If any woman shall be delivered of a child, every person who shall by any secret disposition of the dead body of the said

child, whether such child died before, at, or after its birth, endeavour to conceal the birth thereof, shall be guilty of a misdemeanour.'

It will be seen, from the words of the statute, that the question of live birth does not arise in cases of concealment of birth. All that the medical evidence is required to prove is that the remains are those of a child, and whether the accused woman has or has not been recently delivered. It is uncertain, in the present state of the law, whether a foetus before quickening would come within the meaning of 'a child.'

CHAPTER XXXVII

Birth in its legal relations—Monstrosity—Maternal impressions—Legitimacy—Normal period of gestation—Shortened gestation—Prolonged gestation—Paternity—Superfœtation.

BIRTH IN ITS LEGAL RELATIONS

A MEDICAL practitioner attending a confinement should note the actual time and date of birth, as occasionally medical evidence is called for in courts of law on these points in cases where proof of the attainment of majority within a limited period of time is required, and also in some cases of contested legitimacy. The evidence of the medical jurist may also be required in contested suits concerning the succession to or the inheritance of property. A child that is born alive may, according to the law of England, inherit and transmit property, although its death may immediately follow its birth. Should the child die previous to its *complete birth*, then it does not become the possessor of any civil rights.

By **birth** is legally meant the complete delivery of the child from the body of the mother, with or without the severance of the umbilical cord. No child can be said to be legally and completely born until all its parts are external to the mother. This, however, does not imply that the placenta should have been discharged, or that the cord should be divided. In addition, in order to acquire civil rights, the child must show signs of having been alive after its complete delivery from the body of the mother.

Signs of live birth.—The acts of respiration and crying are undoubted signs of live birth, but they are not essential to the

establishment of it. According to the law of England, the slightest sign of life manifested after the child is entirely outside the body of the mother is sufficient for the purpose. The pulsation of the child's heart, or pulsation in the cord, or the slightest voluntary movement of a limb, or twitching of any of the muscles, will constitute sufficient proof of live birth. Moreover the proof is complete if any one of these signs is manifested for the briefest space of time after entire delivery—their duration is immaterial. According to the law of Scotland, proof of respiration after delivery is required in order to establish live birth.

Tenancy by courtesy.—The question of live birth is of especial importance in connection with what is known as 'tenancy by courtesy.' According to Blackstone, this phrase signifies 'a tenant by the courts of England'; it applies to the case of the husband of a woman possessed of estate, who, in the event of his wife's death, acquires a life interest in the property, provided a *living* child was born of the marriage, during the wife's life. If no such living child has been born, then the estate passes from the husband to the heir-at-law. The law runs as follows:—'When a man marries a woman seized of an estate of inheritance, and has by her issue born alive, which was capable of inheriting her estate; in this case, he shall, on the death of his wife, hold the lands for his life as tenant by the courtesy of England.' This tenancy is, in contested cases, generally established or disproved by medical evidence. In all such cases the law requires the following proofs:—

1. That the child was born alive.
2. That the child was born while the mother was living.
3. That the child was born capable of inheriting—that is, that it was not a monster.

With regard to the second proof, if a child be born by Cæsarean section after the death of the mother, the husband cannot claim the estate, because his wife was dead, and the marriage, therefore, legally dissolved just prior to the time of

birth. In such a case, the mother dies before the child is born, so that her estate at once passes to the heir-at-law, not being intercepted by the birth of a child. If a child born in such a manner survive, it is legitimate, and on attaining its majority can succeed to the estate.

Monstrosity.—The law of England gives no precise definition of what is meant by a 'monster.' According to Lord Coke, it is a being 'which hath not the shape of mankind.' If a child be born without 'the shape of mankind,' it cannot inherit. Although the law does not define the expression 'shape of mankind,' something far more than mere bodily deformity is meant; the presence of deformed limbs, or of supernumerary fingers or toes, will not constitute a monster, provided the being have 'human shape.' The shape refers to *external* shape, and not to internal conformation; for instance, defects or malpositions of the internal organs will not constitute a monster. It does not rest with a medical witness to say whether the being was or was not a monster; that responsibility is left to the court, the decision being based upon the description given by the medical man. The majority of monsters are either born dead, or do not survive birth for long, but no person is justified in destroying a living monster either at birth or afterwards.

Maternal impressions.—The influence of maternal impressions during the period of pregnancy upon the production of deformities in the child, or upon the development of monstrosities, is a subject concerning which very little is definitely known. Certainly, the explanations given by mothers in the majority of cases when children have been born with deformities must be received with the greatest amount of caution, and in many cases with positive doubt. A mother is only too ready to find some explanation for the cause of a deformity of her child, which, otherwise, she would consider a reproach to herself. It is quite possible, however, that the influence of maternal impressions is greater than is suspected; the subject is one that deserves the attention of medical men, especially when they are able to obtain accounts of maternal impres-

sions previous to delivery, and can then judge of any abnormality in the child, when born, in the light of the detailed account previously given. The two following cases have been recently reported. Ross¹ relates the case of a married woman who had a most unconquerable desire for apples during her sixth pregnancy. She would refuse other food in preference, and would eat apples morning, noon, and night. Being in reduced circumstances, she had several disputes with her husband concerning her extravagance in this direction. Several times she got into a frenzy till her desires were gratified, her chief manifestation of temper being to drive her nails into the palms of her hands. This craving was steadily kept up from the first month of pregnancy till term. When the child was born, a small pedunculated growth, about half an inch in diameter, was found on the left hand attached to the hypothenar region at the base of the little finger. It distinctly resembled an apple in appearance with the stalk attached; there was a depression at the insertion of the stalk, and a depression corresponding to the stigma at the opposite side. There was no evidence of any like deformity of the right hand. The growth, on section, was found to possess a cartilaginous nucleus. Garthright² reports the following case. The husband of a woman was severely burnt, by the explosion of a keg of powder, about the hands, arms, face, and neck. When taken home, his wife, who was five months advanced in pregnancy, met him calmly, and, according to her account, without the slightest trepidation. Later on she was delivered of a female child which possessed the following peculiarities. The eyelashes and eyebrows were absent, the eyelids thickened, and the conjunctivæ inflamed; its left ear, like that of its father, was doubled upon itself; on its chin was a large cicatrix, and the face was covered with dark brown blisters; on the neck was a large abraded surface; the hands and arms were blistered, the left thumb was bent over the index-finger, and the other fingers over the thumb, so that

¹ *Brit. Med. Jour.*, 1893.

² *Virginia Med. Monthly*, 1894.

the baby closely resembled, in its disfigurement, the father after he had been injured by the explosion.

LEGITIMACY

The question of legitimacy is seldom decided upon medical evidence alone. The following are the more important legal facts relating to the subject of legitimacy:—

1. Every child born in wedlock is regarded, *prima facie*, to be legitimate, *i.e.* to have the mother's husband for its father, unless impossibility of access or impossibility of intercourse on the husband's part can be proved.

2. If a husband and wife cohabit, or if the slightest possible description of intercourse exist between them, all children born by the woman are regarded as children of her lawful husband, although the woman may be living in adultery at the time.

3. A child is legitimate if born during wedlock, although its conception took place before wedlock.

4. A child born before wedlock is illegitimate by English law, although the parents afterwards marry. In Scotland a child becomes legitimate by the after marriage of its parents.

The matters that specially come under the consideration of the medical jurist in connection with the subject of legitimacy are questions relating to—(i) the normal period of gestation, (ii) shortened gestation or premature delivery, and (iii) prolonged gestation or protracted delivery. Medical evidence in a particular case may be forthcoming to the effect that the period of gestation or asserted gestation was either so short or so long as to negative the assumption that the husband could possibly be the father of the child; or medical evidence may prove the existence of impotency or sterility in the husband or wife, showing in the case of the husband that he could not be the father of the child, and in the case of the wife that the alleged child is a supposititious one.

I. The normal period of gestation.—The varying opinions that exist as to what constitutes the normal period of gestation

are due to the want of a fixed starting-point. Some women calculate the period from certain sensations that they believe they experience at the time of conception; this is a fallacious method, as such sensations may never occur, and, moreover, conception may take place in the unconscious state. The period of quickening is also useless as a starting-point, since it varies greatly in different women, and in some does not occur at all. The cessation of menstruation, though the best method of calculating on the whole, is an uncertain starting-point, since menstruation may cease some time previous to conception, or it may continue for one or more months after pregnancy, or the intervals between menstruation may be very variable periods of time. As conception may take place at any period after a menstrual epoch, a difference of twenty or more days as to its actual date may be introduced, accordingly as it immediately follows one menstrual period, or immediately precedes what would be the following one. Moreover, conception may take place without the occurrence of menstruation.

It may be thought that in those cases where a single coitus results in pregnancy, a positive and certain starting-point is obtained. Such, however, is not the case, since the date of conception cannot be fixed by the date of intercourse. The ovum takes a varying time in its passage along the Fallopian tube to the uterus, and the spermatozoa also take an uncertain time in their ascent; as the spermatozoa have been known to retain their movements for a period of seven days within the female organs, it is possible for conception to be delayed at least seven days from the date of intercourse. A single coitus, therefore, affords no certain datum for fixing the date of conception. Labour has come on at the following varying times after a single coitus—260, 264, 271, 272, 275, 276, 281, 283, 286, and 293 days.

The normal period of gestation cannot therefore be taken as a fixed and definite term; it is generally accepted as occupying 275 to 280 days. It is advisable to always express the duration of pregnancy in weeks or days; the expression of it

in months is very misleading, as they may be either calendar or lunar. When, for the sake of convenience, the periods of gestation are referred to in months in this book, it is to be understood that calendar months are meant.

II. Shortened gestation or premature delivery.—This subject involves the consideration of what may be an important medico-legal question—What is the earliest period at which a viable child may be born? A child may be born alive, but may not necessarily be viable—that is, capable of continuing to live. The subject also has an important bearing in connection with legitimacy, as the question may be raised, whether a fully-developed child can be born before the ordinary period of gestation? For instance, a husband, after a long absence, returns to his wife and renews intercourse; after seven or eight months a fully-developed child is born, and the question may arise—is it a legitimate child? Children born at full term certainly differ considerably in size, weight, and in apparent maturity, so that it is possible for an eight months' child to appear as well and even better-developed than some nine months' children. Montgomery states that he never saw a seven months' foetus which presented the appearances of a fully-matured child; so that though an eight months' child may occasionally resemble in its development a full-term child, such a resemblance cannot occur in the case of a six or seven months' child.

With regard to *the earliest period at which a viable child may be born*, it is well known that children born at the seventh month are capable of living, although they are more delicate and require greater care in their rearing than children born at full term. A viable child may, however, be born at an earlier period than the seventh month, as the following exceptional cases will show. One of the most remarkable that has been recorded is one related by Barker¹ of a female child born 158 days after intercourse. Its size and weight corresponded with the period at which it was born; its length was eleven inches, and its weight was one pound; the nails were very

¹ *Med. Times*, 1850.

rudimentary; the eyelids were closed, and remained so until the second day after birth; the skin was wrinkled. With care the child was reared, but did not walk till she was nineteen months old. Three years and a half after birth the child was healthy, but of small make, weighing only twenty-nine pounds and a half. Outrepont¹ has reported the case of a child born after about 189 days of intra-uterine life. It weighed a pound and a half, and measured thirteen inches and a half. The skin was wrinkled; the nails were very rudimentary; the limbs were small. The child was living at the age of eleven years, but was of small size for its age. Bailly² records the case of a child born after 202 days of intra-uterine life. It was very feeble, and thirteen days after birth weighed about two pounds and three-quarters; it was living and thriving twelve months after birth.

Fœtuses have been born alive as early as the fourth month of intra-uterine life, and have breathed and survived for a few minutes, and in one case where delivery occurred after four months and a half of gestation the child lived for six hours. In such cases, although the children have been born alive, yet they cannot, strictly speaking, be considered to have been viable—that is, capable of continuing to live.

From the cases that have been mentioned the following conclusions may be drawn:—(i) That a fœtus born at an earlier period than the fourth month of intra-uterine existence cannot be said to be born alive. (ii) That a child has been born viable 158 days after intercourse, but that such a case is very exceptional, and that the great majority of infants born at that period would not be viable. (iii) That it would be unjust to brand a child with illegitimacy, or its mother with want of chastity, merely because a six months' child is born alive and viable.

Premature development of the child.—As previously stated, a seven months' fœtus has never been known to present the appearances of a fully-matured child. It is possible, however, for a child born at the eighth month to resemble one born at

¹ *Henke's Zeitschr.*, 1823.

² *Arch. de Tocologie*, 1879.

full term. Many cases have occurred in which children born at the ninth month have considerably exceeded the average, both in size and weight, and it can readily be understood that, if such children had been born a month earlier, they might have exactly resembled in size and weight an ordinary full-term child. For instance, a nine months' child has been born weighing eighteen pounds and measuring thirty-two inches in length, whereas the usual weight of a full-term child is about six pounds and a half, and the length from eighteen to twenty inches.

In England no limit is fixed by law as to the period of premature gestation; each case is determined on its merits. In Scotland a child born six months after the marriage of the mother is considered legitimate. In France and Italy a child born within 180 days after marriage can be repudiated by the husband if no intercourse has taken place between him and his wife before marriage. In Germany a husband can repudiate the parentage of a child, to which his wife has given birth, if he can prove non-intercourse on his part from the three-hundredth to the one hundred and eightieth day before the birth of the child.

III. Prolonged gestation or protracted delivery.—It is well known that the normal period of gestation may be prolonged, but it is difficult to fix the limit of its extension. In England no limit is fixed by law to the period of gestation, each case being tried on its merits. In Scotland a child born ten lunar months after the death of the husband is considered legitimate. In France and Italy the limit is fixed at 300 days. In Germany a child born within 302 days of the husband's death is regarded as legitimate. The longest gestation that has been allowed by an English court is 301 days.

It is incorrect to suppose that a prolonged gestation is necessarily accompanied by an increase in the size and weight of the child, although, from the physiological aspect, it would be imagined that the fœtus should continue to grow *in utero* after the normal term of gestation.

In most of the cases of prolonged gestation that come before English courts of law, the latest possible date of access is usually fixed either by the day on which the husband or alleged seducer went to a distance, or by the day of the husband's death. Medical evidence is then taken as to whether the time that has elapsed between that date and the date of the child's birth is within the period to which gestation can be protracted.

Many cases of prolonged gestation have been recorded. Pürkhauer¹ records a case of a woman who was accustomed, when non-pregnant, to menstruate regularly every twenty-eight days. Her last period occurred on April 28th, 1889, and on March 13th, 1890, she was delivered of a living male child, weighing between eight and nine pounds, and measuring nearly twenty-one inches in length. If conception be reckoned as taking place seven days after the cessation of the last menstrual period, then the duration of the gestation was 316 days. If it be reckoned as occurring seven days before what would have been the time of the next period, then the duration of the gestation would be 300 days. Thompson² relates a case in which the duration of gestation reckoned from the last coitus was 301 days, or, reckoned from the last day of menstruation, it was 317 days. Duncan³ records a case of a woman in whom gestation lasted for 300 days with her first child, for about 285 days with her second and third, and for 325 days with her fourth, reckoning from the cessation of the menstrual periods. In connection with her fourth pregnancy, menstruation ceased on January 15th, quickening occurred about the beginning or middle of May, but the delivery, which was expected about October 15th-21st, was delayed until December 7th. Murray⁴ records a case in which 330 days elapsed between the cessation of menstruation and delivery. Symptoms, as the woman thought, of labour came on at what she considered the normal period, but passed off.

¹ *Friedreich's Blätter f. ger. Med.*, 1890.

² *Obstet. Transactions*, 1885. ³ *Med. Times and Gazette*, 1877.

⁴ *Brit. Med. Jour.*, 1889.

Six weeks later she gave birth to a stillborn child, weighing seven pounds and a half. Resnikoff¹ records a remarkable case of protracted pregnancy which was under his observation throughout its duration, and in connection with which 342 days elapsed between the cessation of menstruation and delivery. The patient was delivered by Resnikoff in 1891 with the aid of forceps at term; owing to narrowing of the pelvis, he advised induction of labour about two weeks before term at the next pregnancy. On January 11th, 1893, the period was seen for the last time. At the beginning of March, Resnikoff examined her, and found her over six weeks pregnant; the date of term was fixed for October 18th. Premature labour was not induced, as the patient objected to it. From October 18th to 20th distinct uterine pains were felt, but they subsided, and she felt well for some time; foetal movements were very distinct up till December 12th, when they ceased altogether. On December 19th, the woman was spontaneously delivered of a male child, dead and macerated.

In a considerable number of cases of alleged prolonged gestation, pregnancy has, in all probability, occurred during a suspension of the menses, which may have ceased one, two, or three months previous to the occurrence of conception, and yet the calculation of the period of pregnancy will be based upon the time at which the last menstrual period occurred.

PATERNITY AND AFFILIATION

The question of *paternity* especially arises in connection with bastardy cases, where the reputed father is called upon to support the child; it also arises when a child who claims to be heir to an estate is alleged to be supposititious. The question of paternity might also arise where a widow marries about a month after the death of her first husband, and a child is born from nine to ten months later. Paternity and affiliation are

¹ *Centralbl. f. Gynäk*, 1894.

determined by circumstantial evidence, and by *likeness to the father*, the resemblance being sought for, not only in the features, but in the voice, manner, attitude, and other characteristics. In connection with a bastardy case, a man may deny that he is the father, and allege in support of his denial that at the time of the conception of the child he was under treatment for syphilis or gonorrhœa. The medical jurist may then be asked the questions as to whether such diseases are invariably transmitted by sexual intercourse, and as to whether they necessarily interfere with the function of procreation? To both these questions negative answers should be returned.

SUPPOSITIOUS CHILDREN

A woman may feign delivery, and then represent the child of another as her own offspring, or a woman may substitute the living child of another for a dead child, or for a mole of which she had just been delivered, or a male child may be substituted for a female one. A fraud of such a nature, if successfully accomplished, may seriously affect the rights of inheritance, but since at least one accomplice is required for its successful performance, it needs much cunning to safely carry out. If a medical man be summoned to attend a woman in labour, and the child has been born previous to his arrival, it is his duty to ascertain that the woman has been recently delivered, that the child has been recently born, and to examine the placenta. Especially should this duty be insisted on, if the medical man be called to attend a woman of whose pregnancy he has had no previous knowledge, and when the child is said to have been born previous to his arrival.

SUPERFŒTATION

By superfœtation is meant a second conception taking place in a woman already pregnant. The two children may be born at the same time, differing considerably in their maturity,

or two mature children may be born at different times. Some obstetricians regard superfœtation as an impossibility; others believe that it may exceptionally occur. According to Reese,¹ the proof of it is established by the fact of a woman giving birth to two children of different colours, and by her admitting to have had intercourse with a white and black man successively. In the case of a woman possessing a double uterus, superfœtation must be regarded as possible. As regards the possibility of a second ovum becoming impregnated in an already pregnant uterus, it has been shown that the mouth of the womb is not closed at once after conception, and that until the third month of gestation the union of the membranes is not so complete as to interpose an absolute barrier between the ovum and the spermatozoa; moreover, the plug of viscid mucus in the cervical canal allows of the passage of spermatozoa.

The discharge of the ovum, as a rule, ceases during pregnancy, but there are grounds for believing that exceptions to this rule occasionally occur. Galabin² relates a joint case of intra-uterine and extra-uterine pregnancy, as showing that ovulation occasionally occurs during pregnancy: a five months' fœtus was found in the abdomen, and one of three months in the uterus. Double conception has been observed in the lower animals—a mare covered successively by a horse and an ass produced, at the same birth, a horse and a mule.

No doubt the majority of the alleged cases of superfœtation can be accounted for by either the occurrence of twin pregnancies, where one fœtus has developed at a greater rate than the other, or by the existence of a double uterus, with or without separate vaginæ. Ross³ records a case illustrative of the latter condition. A woman was delivered on July 6th of two fœtuses of about six months of intra-uterine life; on October 31st she was delivered of a full-term child. On subsequent examination she was found to possess a double uterus. What doubtless had happened was that one cavity of the uterus was prematurely

¹ *Med. Jurispr.*, 1891.

² *Manual of Midwifery*, 1886.

³ *The Lancet*, 1871.

delivered of twins, and that the other retained its contents up to the full period of gestation. Pincott¹ records a case of twin pregnancy with a considerable interval between the births. A woman gave birth to a weakly female infant, which died the same day; the placenta came away in the usual manner. Thirty-five days later she gave birth to a second and well-developed female infant at full term; the child was still-born, but foetal movements were felt shortly before the rupture of the membranes.

If a second mature infant be born from one to three months after the birth of the first, the occurrence may certainly be due to a twin pregnancy, the development and consequent maturity of one foetus having, for some reason or reasons, been delayed. If, as some obstetricians believe, natural labour is induced by maturity of the foetus, it is quite conceivable that a partially-developed foetus may remain in the uterus for some time beyond the limit of the normal period of gestation. It must, however, be admitted that exceptional cases occur, which cannot be explained by the supposition of either twin pregnancy or the existence of a double uterus, and which probably are due to two successive conceptions.

¹ *Brit. Med. Jour.*, 1886.

CHAPTER XXXVIII

Sexual abnormalities—Hermaphroditism—Impotency—Sterility—Causes of impotency and sterility—Medico-legal relations of divorce.

SEXUAL ABNORMALITIES

THE question of sex may arise in connection with newly-born children, as to whose sex there may be some doubt, and later in life the questions of sexual capacity and development of the sexual organs may require the consideration of the medical jurist in connection with sterility, impotency, and rape.

Hermaphroditism is a term that is strictly applied to the presence of the organs of both sexes in the same individual; in its common acceptation it is frequently meant to designate all cases of doubtful sex. The embryo is at first hermaphroditic, both sets of organs being present; if growth and development in a new direction take place, the male organs are formed; but if, during their formation, aberrations or arrest of development occur, then a condition of the organs is produced in which the sex may be doubtful. For instance, an extreme form of hypospadias, in which the urethra remains open on the under surface, may cause the male organs to simulate abnormally formed female organs; the male organs may also somewhat resemble abnormal female organs if, with non-descent of the testicles, there is combined a cleft scrotum. In the early stages of development of the male organs, the part corresponding to the scrotum is divided by a fissure; if this fissure persist, then the commonest form of sexual abnormality

results—the hermaphroditic form, with a predominance of the male characteristics.

So-called **true hermaphroditism** consists in the conjunction in the one person of parts of both the male and female generative organs, and is generally due to the persistence and development of the Wolffian and Müllerian ducts in the one individual. This form of hermaphroditism is classified by Sir J. G. Simpson¹ as follows :—

Lateral.—Testicle on one side, and ovary on the other.

Transverse.—External organs male, and internal female, or the reverse.

Vertical, or double. { (a) Ovaries with combined male and female passages.
(b) Testicles with combined male and female passages.
(c) Ovaries and testicles co-existing on one or both sides.

Ceccherelli² relates a case of a living example of vertical hermaphroditism, the subject at the time of the examination being fourteen years of age. There was a hypospadiac penis; the scrotum was divided and contained one testicle; between the folds of the split scrotum, or labia, the neck of the uterus could be felt. The breasts were well developed, and the female organs appeared complete. Menstruation had occurred regularly since the twelfth year of age, and the individual had had sexual connection as a woman. From the opening in the penis semen was ejected, a specimen of which was found to contain spermatozoa. Very frequently hermaphrodites are impotent and sterile owing to defective development.

IMPOTENCY AND STERILITY

By **impotency** is meant incapacity for sexual intercourse; by **sterility** is meant incapacity for procreation—e.g. a male whose semen contains no spermatozoa, or a female destitute of ovaries. In the female, incapacity for sexual intercourse (*not*

¹ Todd's *Cyclopædia of Anatomy*.

² *Lo Sperimentale*, 1874.

sterility) can alone be adduced as a ground for divorce. In the male, also, the legal disqualification on the ground of impotency is incapacity for sexual intercourse. Impotency may depend upon *physical* or *moral* causes. The moral causes of impotency are not recognised by law, and therefore do not concern the medical jurist.

Physical causes of impotency and sterility in the male.

1. Extremes of age.
2. Congenital malformations.
3. Diseased conditions.

I. **Extremes of age.**—The procreative power in males usually commences at puberty, with the full development of the sexual organs, especially the testicles. The non-arrival of puberty is therefore one of the causes of impotency. The exact age of male puberty varies, but, as a rule, it may be taken at from fourteen to seventeen years. The English law recognises fourteen years in the male, and twelve in the female, as the earliest ages at which marriage may be contracted. The rule for a medical man to follow, when examining a male of reputed sexual power, is not so much to pay attention to the age, but to carefully notice the condition of development of the sexual organs, as well as the general physical and moral development of the individual. The development of sexual power is generally accompanied by well-marked changes in the person, such as a change in the tone of voice, the growth of hair on the pubes, development of the penis, and general muscular development. Several cases of early paternity have been recorded; many have occurred in which boys at fourteen years of age have become fathers. The earliest recorded¹ age of the development of the procreative functions in the male is the case of a boy who, when not quite thirteen years of age, impregnated a young woman, who confessed to leading him astray, and to allowing him to have intercourse at least a dozen times. The boy possessed well-developed generative organs.

¹ *Brit. Med. Jour.*, 1887.

The procreative power in the male may continue to very advanced age; spermatozoa have been found in the semen of men over eighty years of age. The English law has placed no limit to the age when old men may marry, thereby tacitly admitting no limit, as far as old age is concerned, to the power of sexual intercourse.

II. Congenital malformations.—The physical causes of impotency and sterility in the male resulting from congenital malformations are various forms of *hermaphroditism*, *absence of the penis*, *malformations of the penis*, and *absence of both testicles*. The subject of hermaphroditism has already been discussed (see p. 241), and the fact of complete absence of the penis rendering a male impotent is obvious; the two last mentioned forms of congenital malformation are therefore the only ones to be dealt with in this section.

Malformations of the penis.—Extreme degrees of epispadias and hypospadias constitute mechanical impediments to impregnation. *Epispadias* is a cause of sterility, in that the semen is unable to reach the vagina. *Hypospadias* may or may not be an impediment to impregnation, according to its degree; if the cleft or fissure extend far back to the root of the penis or scrotum, then the semen is unable to reach the vagina; impregnation has, however, resulted from artificial transference of the semen to the vagina. Extreme degrees of epispadias and hypospadias may therefore be a cause of sterility in the male, although such a person is not impotent; since, however, such a person can eject semen containing spermatozoa, a medical jurist should employ great caution in expressing an opinion as to the possibility, or not, of impregnation under such conditions; this caution is necessary, as impregnation may occur from mere ejection of semen on to the vulva, without any propulsion of it into the vagina.

Absence of the testicles.—If one testicle only be present in the scrotum, the individual is known as a *monorchid*. Such a condition may be due either to imperfect development, or to removal of one testicle by operation; in neither case does it

interfere with the capacity for procreation. The absence of both testicles from the scrotum, owing to their non-descent, does not necessarily produce sterility in the male, although the condition is very likely to lessen the procreative power, and may be an actual barrier to it; an individual possessing undescended testicles is known as a *cryptorchid*. Taylor and Stevenson relate the cases of two cryptorchids who were in possession of indisputable procreative functions. One of them, before he had reached the age of thirty years, had been twice married, and had had children by each wife, besides illegitimate children which were affiliated on him. The other had a well-developed penis, but the scrotum was absent and the testicles were undescended; this man had married when he was twenty, and had had two children by his first wife, and had married a second time when he was twenty-seven years of age.

Entire absence of both testicles renders a man sterile. If they are removed by operation from a man at the period of sexual activity, it is possible for fruitful intercourse to occur for a very limited period after such emasculation, but such power is eventually lost. This temporary retention of the procreative function is probably due to some seminal fluid remaining in the vesicles and ducts. The power of copulation should not be confounded with the procreative power. Although the removal of both testicles deprives a man of the power of procreation, it does not necessarily render him impotent. It seems to be generally admitted that eunuchs, or at least some eunuchs, possess the power of copulation to a great degree.

III. Diseased conditions.—Advanced disease of the testicles or of the penis may be a cause of impotency or sterility. Mumps may cause, as a complication, inflammation of the testicles, which may lead to atrophy of those organs. Severe general debility, due either to inherited weakness or to disease, may be the cause of temporary or permanent loss of the sexual functions. Diseases of the nervous system tend to derange or abolish the sexual function. Cerebral exhaustion, due to various diseases, blows on the head or spine which affect the brain and

spinal marrow, tabes dorsalis in the later stages, and long-standing chronic myelitis may all cause suspension or destruction of the sexual power.

Physical causes of impotency and sterility in the female.—

These may be arranged in the following four groups, for a detailed exposition of which works on gynæcology should be consulted :

1. Causes preventing the entrance of semen into the uterus.
2. Causes preventing the production of a healthy ovum.
3. Causes preventing the passage of the ovum into the uterus.
4. Causes destroying the vitality of the spermatozoa, or interfering with the fixation of the impregnated ovum.

As previously stated, conception may take place in women who have never menstruated. In a few cases menstruation never occurs throughout life, although such women may have given birth to several children.

MEDICO-LEGAL RELATIONS OF DIVORCE

The marriage contract implies a capability on the part of both persons for the consummation of the sexual act, so that incapacity in either person to perform the act, provided the incapacity be permanent and be not curable, constitutes a legal ground for annulling the contract. In connection with divorce there are two questions that may require the consideration and intervention of the medical jurist: (i) *Unsoundness of mind*, which, if it existed at the time the marriage took place, constitutes a civil disability, which invalidates the marriage. (ii) *Impotency*, or *physical incapacity for the sexual act*, which constitutes a canonical impediment to marriage.

I. **Unsoundness of mind.**—This plea can only be entertained in a suit for nullity of marriage when the insanity existed at the time the marriage took place. As unsoundness of mind precludes a rational assent being given to a contract, the fact that one of the parties was insane at the time it was made

renders that contract null and void. As a rule, when this plea is put forward in a nullity suit, the insanity is observed by the petitioning party shortly after marriage. Unfortunately, relations will occasionally conceal the existence of mental disorder in the affected person from the other party to the projected marriage, trusting that the mental unsoundness will be remedied by the new conditions of life—a change which generally has the opposite effect.

In the case of *Hanbury v. Hanbury* (Divorce Court, 1892), the plea of insanity was put forward in an entirely novel manner. The case was an action for dissolution of marriage brought by the wife against the husband on the ground of his adultery and cruelty. The defence was that the respondent was suffering from insanity at the time or times the acts complained of were committed. The President, Butt J., in his summing up, said that it had been argued that insanity was an answer in a suit for dissolution of marriage, and although he was far from asserting that it was not in any case, yet, he thought, to make the plea a good one, that the insanity must be lasting. The point raised in the defence was not decided, as, although a decree *nisi* was granted, the jury were influenced in arriving at their decision by the fact that the respondent had given way to great excess in alcohol.

II. Impotency, or physical incapacity for the sexual act.—This constitutes a canonical impediment to marriage, and if one of the contracting parties be labouring under such disability, the contract is voidable. Impotency may be due to malformation, or to any physical cause which may render intercourse impossible. A suit for nullity of marriage on the ground of impotency may be procured by either party, provided it can be shown that the incapacity for intercourse existed at and before marriage, and that it is incapable of being cured. There should be no great delay in bringing the suit, and there should be proof that the incapacity was unknown to the petitioner at the time of the contract. There is no ground for a suit if the incapacity supervened after the marriage. To sustain the

charge of incapacity a medical examination is necessary; but the consent to the examination of either the man or woman must be obtained; the court cannot compel such examination. In the event of a refusal to submit, the case would have to be decided on whatever other evidence was forthcoming, which would probably be adverse to the party so refusing.

The malformation need not necessarily be of such a nature as absolutely to prevent intercourse. If it interpose only a partial obstacle, it may be sufficient to render the marriage null and void. As previously stated, the incapacity must be permanent. If it be curable, the decree can be refused. If, however, an operation that would be very dangerous to life is required to effect a cure, then the malformation is regarded as incurable.

Refusal of marital intercourse is not sufficient to obtain a decree, although persistent resistance on the part of the wife has been so regarded; the court has then inferred incapacity on the part of the woman, and has therefore granted a decree of nullity. In the case of *Hewitt v. Pery* (Divorce Court, 1873)—a suit for nullity brought by the husband—the evidence of the husband was to the effect that, although there had been more than three years' cohabitation, there had been no consummation of the marriage. There was no structural impediment on the part of the wife to the act of coitus, but whenever it was attempted an attack of hysteria was brought on which rendered intercourse practically impossible. The wife refused to submit to an examination, and did not appear as a witness. Hannen J. granted a decree *nisi* for annulling the marriage, but observed that such a decree could only be granted on the ground that there was a physical difficulty, and not merely on the ground of wilful refusal on the part of the wife. It must be shown, as in this case, that injury may be done to health by inducing an attack of hysteria or other disorder.

Vaginismus, which is a curable condition, does not constitute a legal ground for divorce, according to the law of England. The affection consists of a peculiar hypersensibility

of the nerves of the vaginal mucous membrane at the site of the vagina, which, upon any attempt at coitus, causes spasmodic contraction of the sphincter vaginae muscle and intolerable pain to the woman. The condition is, however, curable by destruction of the hymen, forcible dilatation of the vagina, and other means.

The validity of a marriage on the ground of physical incapacity cannot be disputed after the death of one of the parties. A third party cannot institute a nullity suit after the death of husband or wife. Incapacity does not render a marriage void, but voidable, and it can only be voidable while the two contracting parties are living.

The medical evidence to prove non-consummation of marriage is obtained by medical examination of the generative organs, which is made by two medical inspectors appointed by the court. The husband and wife may conjointly select two medical men, or may each nominate one. The duties of these medical inspectors are explained by the following oath, which is administered to them :—

‘ In the High Court of Justice. Probate, Divorce, and Admiralty Division (Divorce).

‘ A.B., and C.D., doctors of medicine.

‘ You are produced as inspectors in a cause depending in the Probate, Divorce, and Admiralty Division of the High Court of Justice (Divorce) entitled, falsely called v., to examine the parts and organs of generation of, the petitioner in this cause, and also of, falsely called, the respondent in this cause.

‘ You respectively swear that you will faithfully, and to the best of your skill, inspect the parts and organs of generation of each of them, the said and, and make a just and true report in writing to the Right Honourable the President of the above Division, whether the said [the petitioner] is capable of performing the act of generation, and, if incapable, whether such, his incapacity, can be cured by art or skill ; and also, whether the said is or is not a virgin, and whether she hath or hath not any impediment on her part to prevent the consummation of marriage, and that one of you will deliver such report

under your hands and seals, closely sealed up, to one of the registrars of the above Division.

' Sworn at the Principal Registry of the Probate, Divorce, and Admiralty Division of the High Court of Justice, this day of, 18.. ..., Before me,, Registrar.'

[Signatures of the medical inspectors.]

CHAPTER XXXIX

Rape—Medical evidence in connection with rape—Rape on infants and young children—Rape on young females after puberty—Signs of virginity—Rape on adult women—Examination of seminal stains—Unnatural sexual offences.

RAPE

Legal definition of rape.—Rape is legally defined as ‘the carnal knowledge of a woman by force, and against her will.’ A more comprehensive definition would be: the carnal knowledge of a woman without her conscious permission, or with such permission obtained by physical violence or fraud. The carnal knowledge of a girl under the age of thirteen years, with or without her consent, constitutes rape. It is immaterial whether the female be married or single, or whether she be chaste or unchaste, provided the carnal knowledge be against her will, it constitutes a rape. Formerly, rape was punished as a capital crime; it is now regarded as felony, and is punishable by penal servitude or imprisonment. Previous to 1885, the carnal knowledge of a girl of or over ten years of age, provided she consented to the act, was not a punishable offence. The provisions of the Criminal Law Amendment Act of 1885 render it a criminal offence to have carnal knowledge of a girl under the age of *sixteen*, whether she consent or not. The condition of the law at present will be understood by reference to the following extract from the Act referred to:—

‘Any person who unlawfully and carnally knows any girl under the age of thirteen years shall be guilty of felony, and being convicted thereof shall be liable at the discretion of the court to be kept in penal servitude for life,

or for any term not less than five years, or to be imprisoned for any term not exceeding two years, with or without hard labour.

‘Any person who attempts to have unlawful carnal knowledge of any girl under the age of thirteen years shall be guilty of a misdemeanour, and being convicted thereof shall be liable at the discretion of the court to be imprisoned for any term not exceeding two years, with or without hard labour.

‘Any person who unlawfully and carnally knows or attempts to have unlawful carnal knowledge of any girl being of or above the age of thirteen years and under the age of sixteen years; or unlawfully and carnally knows, or attempts to have unlawful carnal knowledge of any female idiot or imbecile woman or girl, under circumstances which do not amount to rape, but which prove that the offender knew at the time of the commission of the offence that the woman or girl was an idiot or imbecile, shall be guilty of a misdemeanour, and being convicted thereof shall be liable at the discretion of the court to be imprisoned for any term not exceeding two years, with or without hard labour.

‘Provided that it shall be a sufficient defence to any charge under sub-section one of this section’ [referring to the girl being of or above the age of thirteen years and under the age of sixteen years] ‘if it shall be made to appear to the court or jury before whom the charge shall be brought that the person so charged had reasonable cause to believe that the girl was of or above the age of sixteen years. Provided also, that no prosecution shall be commenced for an offence under sub-section one of this section’ [referring to the age of the girl being of or above thirteen years and under sixteen years] ‘more than three months after the commission of the offence.’—Criminal Law Amendment Act, 1885 (48 & 49 Vict., ch. 69).

The following points are the principal ones to be noticed in connection with the Criminal Law Amendment Act of 1885:—
 (i) If a girl under the age of **thirteen years** consent or not, a person having unlawful carnal knowledge of her is guilty of felony if he effect his purpose, and of a misdemeanour if he attempt only. (ii) The unlawful carnal knowledge of a girl of or above the age of **thirteen**, and under the age of sixteen, whether she consent or not, is a criminal offence. (iii) If a girl of or above the age of **sixteen years** (provided she be not an idiot nor imbecile) consent to the act, rape is not committed. (iv) The question of age does not refer to idiots nor to imbeciles; even with consent on the part of a female idiot or imbecile woman or girl, the aggressor is guilty of a misdemeanour if

the age of the female is above **thirteen**, and of a felony if the age is below thirteen. (v) Consent or even solicitation on the part of any girl below the age of **sixteen years** does not do away with the criminality of the act.

The criminal law enacts that a boy **under fourteen years** cannot be indicted for rape or attempted rape, as he is presumed to be incapable of committing a rape; he, can, however, be indicted for having committed an indecent assault. In 1893 the case of *Reg. v. Williams* came before the court for consideration of Crown Cases Reserved. The prisoner, a boy under fourteen years of age, was convicted at the Mold Spring Assizes, 1892, before Vaughan Williams J., for having committed an indecent assault. The indictment was made under section 4 of the Criminal Law Amendment Act. It was to the effect that the prisoner had 'feloniously, unlawfully and carnally known a girl under the age of thirteen.' The boy being under fourteen years of age, the judge directed that he could not be tried for rape, nor for an attempt to commit a rape, but that he could be tried under section 9 of the said Act for indecent assault; of this offence he was found guilty and convicted. The question reserved for the Court for consideration of Crown Cases Reserved was whether the indictment was good in law—that is to say, whether, it having been made under section 4 in terms which implied rape, or attempt at rape, a conviction could be obtained under section 9, which covered the minor offence only. The Appeal Court upheld the decision of the judge.

Rape by females on males.—According to Taylor and Stevenson, this crime is unknown to the English law. Several cases of the kind have come before the French criminal courts, in which females have been charged with having forcible sexual connection with young boys.

Definition of 'carnal knowledge.'—Formerly, in order to substantiate a charge of rape, proof of both penetration of the male organ and emission of semen was required. The law (24 & 25 Vict., ch. 100) at present is that proof of penetration

only is required, the fact of the emission of semen being immaterial. It has been settled in the Appeal Court that to constitute a rape, penetration, without effecting rupture of the hymen, is all that need be proved; the degree of penetration is immaterial, vulval penetration constituting rape as much as vaginal penetration. The expression 'partial penetration' should never be used by the medical jurist, as it would only tend to confuse the court; the expression should have no place in forensic medicine. By 'carnal knowledge' is therefore meant any degree of sexual intercourse, from mere introduction of the penis within the vulva, with or without emission, to complete vaginal penetration with emission.

If a man personate the husband of a married woman, and so has intercourse with her, with her consent, but obtained by fraud, he is guilty of rape. Formerly doubts were entertained as to whether such an act constituted rape, as some judges held that consent, although obtained by fraud, did away with the criminality of the act. The question is now definitely decided by law as follows:—

'Whereas doubts have been entertained whether a man who induces a married woman to permit him to have connexion with her by personating her husband is or is not guilty of rape, it is hereby enacted and declared that every such offender shall be deemed to be guilty of rape.'—Criminal Law Amendment Act, 1885 (48 & 49 Vict., ch. 69).

Medical evidence in connection with rape.—As the crime of rape is usually committed when the victim and assailant are alone, the evidence of a single person, viz. the victim, is all the legal proof that is absolutely necessary. As, however, false accusations are very common (according to Amos one real rape is tried on the circuits to about twelve pretended cases), corroborative evidence is generally required, and for this purpose medical testimony is usually sought. The medical testimony must be based upon the physical appearances presented by the genital organs of the supposed victim, and not upon statements made by the prosecutrix or by her mother, as in such a case a false charge might be easily made and sus-

tained. False accusations of rape are, unfortunately, by no means uncommon, not only by women and grown-up girls, but occasionally they are also made by children, who have been taught by their mothers to tell a circumstantial tale of rape or attempted rape by some individual—the accusation being concocted either for the purpose of extorting money, or for the sake of revenge. In such cases the mothers may even go so far as to produce physical injuries to the external genitals, in order to simulate those caused by criminal assaults.

Duties of a medical man in connection with a case of alleged rape.—The following are the principal particulars to which the attention of a medical practitioner should be directed when called upon to investigate a case of alleged rape—(i) A note should be made by the practitioner of the exact time and date at which he is summoned to the case; this may prove an important factor in the case, either by showing that the prosecutrix did not take the earliest available opportunity of complaining of the alleged rape, or of being useful in defeating a false alibi set up by the accused. (ii) The female should be visited at once without giving her time for preparation; previous to making the examination note should be taken as to whether the girl or woman appears to suffer pain and inconvenience when walking. In cases of rape, the female frequently walks with difficulty, owing to the inflamed and painful condition of the genital organs, and to the instinctive dread of separating the thighs. This sign is an important one, as it is not likely to be simulated. (iii) Before an inspection and examination of the sexual organs is made, the free consent of the female must be obtained; the examination cannot be compulsory, although, if it be refused, it would constitute a strong point against the truth of the accusation. (iv) Careful examination should be made for marks of violence about the genitals (for the details of this examination see p. 269), and for bruises, wounds, or other marks of injury generally on the person of the female. The clothing should be carefully examined for seminal and blood stains, and any suspicious stains should be preserved for

subsequent examination ; specimens of the mucus between the folds of the vulva and of the contents of the vagina should be removed with a glass rod or silver spatula and examined with the microscope for spermatozoa, and any stiffened masses of the genital hairs should also be carefully removed and preserved for microscopic examination. The existence of gonorrhœa or syphilis in the female should, if possible, be determined. (v) If a medical examination of the accused man or youth be made, his free consent must be obtained before an inspection and examination of his generative organs can be made. The presence of any marks of violence on the person should be observed ; the clothing should be examined for seminal and blood stains, and for the presence of hairs ; if possible, the existence of gonorrhœa or syphilis should be determined.

It will be convenient to consider the subject of rape in the following order :—1. Rape on infants and children. 2. Rape on young females after puberty. 3. Rape on adult women.

1. RAPE ON INFANTS AND CHILDREN

Rapes on young children are far more common than on adult women. There are many reasons to account for this, the most obvious being the comparative ease with which it may be attempted, owing to the ignorance and feeble powers of resistance of children. Another revolting reason for the commission of the crime is the erroneous superstition among some ignorant persons that an obstinate gonorrhœa or an attack of syphilis is cured by having sexual intercourse with a virgin.

Of 111 cases of rape examined by Casper, *over seventy per cent.* of the victims were below twelve years of age. It should, however, be carefully borne in mind that many alleged cases of rape on young children are fraudulent and trumped up, with the object of extorting money, or of wreaking revenge on some man.

In cases of rape on young children the genital organs nearly always present marks of injury, provided the examination be

not made at too late a date; owing to the great difference in size of the sexual organs, a rape could not be perpetrated by a man upon a young child without being attended with severe injuries to the genital organs of the latter. Externally the vulva and genitals generally are swollen, congested, hot, and tender; ecchymoses, lacerations, and effusion of blood are generally present. If an examination be made two to three days after the commission of the rape, the mucous membrane of the vagina may be found inflamed and abraded; occasionally blood may be oozing from it, but more frequently there is a yellow or greenish-yellow muco-purulent discharge from the vagina, ultimately becoming glutinous. In rapes on very young children the hymen is not usually lacerated, although such occasionally occurs. This non-laceration is due to the depth at which the hymen is situated, and to the difficulty of vaginal penetration owing to the general narrowness of the parts. If the hymen be lacerated, the tears or slits may be continued through the mucous membrane of the vulva and vagina, or there may be simply one slit in a backward direction towards the commissure, or in exceptional cases the hymen may be almost entirely destroyed. In fifty-four cases of undoubted rape upon children, many of them under fourteen years of age, Casper found the hymen uninjured in four-fifths of the number. Unless sufficient force be used to tear open the parts, a rape may be accomplished without producing more than superficial injuries. It has been stated that very occasionally the vagina may be dilated, but it would seem that, in recent cases, the vagina generally appears more than usually contracted, on account of the swelling. Owing to the extension of inflammation to the urethra, the child may, later on, experience painful micturition.

Rapes have been perpetrated on mere infants. In *Reg. v. Harris* (Bristol Lent Ass., 1873), the prisoner, an adult, was convicted of rape on an infant only *seven months* old. The vulva was swollen, and there was slight excoriation about the labia minora, with a little bleeding, but no great amount of

violence had been inflicted; the hymen and vagina had escaped laceration. Seminal fluid was found on the person of the child. In such a case there might have been penetration to the vulva.

Marks of violence.—Owing to non-resistance, or incapacity for more than feeble resistance, on the part of mere children, marks of violence on the body are seldom met with. Occasionally bruises and contusions may be found on the legs. If the genital organs present marks of violence, the assumption must not be hastily made that they necessarily indicate a rape, since, as previously mentioned, they may have been purposely inflicted as a foundation for a false charge. On the other hand, the absence of injuries about the genitals may be due to their disappearance, owing to the examination having been delayed for some time. As illustrative of this latter point, and as showing the rapidity with which signs of rape may disappear in young children, Casper met with a case in which a man, aged thirty-seven, committed a rape on a girl eight years of age. The girl was examined the following day, and the labia were then reddened, and the mucous membrane at the entrance of the vagina was injected. Eleven days after the assault the sexual organs were in their normal state, and there was nothing to indicate that the girl had been subjected to any violence.

It should be borne in mind that the hymen is occasionally absent in young children, owing either to congenital absence, or to its destruction by chronic suppurative inflammation or ulceration of the parts, affections to which weakly and badly fed children are somewhat prone. The absence, therefore, of the hymen does not afford proof of the perpetration of rape, unless it be accompanied by signs of the infliction of violence on the genital organs generally.

It is possible for the male organ to produce a great deal of physical injury. Laceration or rupture of the vagina or perineum may occur, and then constitute important signs. M'Kinlay¹ reports a case of extensive injuries inflicted on a girl, six years

¹ *Glasgow Med. Jour.*, 1859.

of age, by rape. The vagina was ruptured in various directions, one laceration dividing the recto-vaginal septum and perineum down to the verge of the anus. There was a lacerated opening in the coats of the rectum, and the genitals generally were raw and swollen. The child recovered from these injuries in about two months. It should be remembered that it is possible for hæmorrhage to occur from the injuries inflicted on the genitals by a rape, and yet for no blood to be found on the private parts or clothing of the assailant. Taylor and Stevenson relate the case of a girl, aged seven years, upon whom a rape was perpetrated by a boy under seventeen years of age. The girl was examined about half an hour after the occurrence, and it was then found that there was complete destruction of the hymen, and a laceration extending into the perineum. There had been profuse bleeding. The boy was examined about an hour after the perpetration of the rape, and, although he had been under strict custody, and had had no opportunity of changing his clothes, there was no blood found about his private parts or on his clothing. This was probably due to the boy being interrupted in the act, and suddenly withdrawing after having caused the laceration, so that the bleeding was an after effect from the ruptured vessels.

Occasionally, owing to the violence used, laceration of the external genitals is followed by sloughing, or the violence employed may just stop short of lacerating the parts, and yet be sufficient to cause subsequent sloughing. Care must be taken not to confound noma pudendi or gangrenous inflammation of the vulva for the sloughing that may follow the infliction of criminal violence. Noma pudendi is a pathological sloughing occasionally occurring as a complication or sequela of diphtheria, variola, and other prostrating diseases; it is generally found among neglected and dirty children, suffering from exhaustion and want of food.

Death may be caused by the injuries inflicted on the genital organs and surrounding parts by a rape, especially when brutal attempts are made by a male adult to effect penetration of the

immature sexual organs of a young girl. The fatal result may be due to shock, hæmorrhage, the after effects of wounds, or extension of the injury into the bladder, rectum, or peritoneal cavity. Colles¹ reports the case of a girl, aged eight years, who was raped by an adult. She died from peritonitis in six days. At the autopsy the perineum was found torn, and the vagina gangrenous.

Purulent discharges from the vagina following rape.—After a rape, a purulent discharge may occur, not due to gonorrhœa, but the result of vaginitis, arising from the irritation of violent intercourse. It may, therefore, be found on the victim without being found on the assailant. Such a discharge should not be confounded either with infantile leucorrhœa or with gonorrhœa. The former disorder especially occurs among badly-fed and dirty children, living amongst unhealthy surroundings. Such a discharge is frequently regarded by ignorant people as a proof of rape or of impure intercourse, or may be made the ground for a false accusation of rape against an innocent man, on the part of an unprincipled mother, who possibly may have carefully tutored the child to tell a concocted story. Infantile leucorrhœa, in addition to being caused by bad hygienic surroundings, may result from local causes of irritation—such as worms, or uncleanly habits, or from a reflex cause of irritation, such as dentition. The leucorrhœal discharge may be distinguished from that produced by criminal violence, by the absence of signs of injury to the vulva, perineum, hymen, and vagina; and also by the discharge being more abundant than that due to violence.

Great caution should be exercised by a medical practitioner in making a statement as to the gonorrhœal nature of a vaginal discharge in a young child. A true gonorrhœal discharge does not generally come on till the fourth to the eighth day; it is usually much more profuse than a discharge due to violence from rape, or due to infantile leucorrhœa; a gonorrhœal discharge lasts a longer time—at the end of ten or twelve days it

¹ *Med. Times and Gaz.*, 1860.

usually remains, whereas a discharge due only to the violence of rape has generally, by that time, ceased, or is ceasing. A statement on oath as to the gonorrhœal nature, or not, of a discharge from the presence or absence of gonococci, is not justifiable in the present state of bacteriology. The question as to whether gonorrhœa or syphilis (not of the congenital kind) can be communicated to young children otherwise than by sexual contact must be answered in the affirmative, as by the use upon the person of a child of a sponge, cloth, &c., previously employed by an adult affected with one of those disorders. Such cases, however, are very exceptional. Taylor and Stevenson mention the cases of two sisters, one of one year and the other of four years of age, who became infected with gonorrhœa by reason of their being washed in a vessel of water with a sponge used by a young woman affected with profuse gonorrhœal discharge. Had an accusation of rape been made against a man suffering from gonorrhœa, this condition of the children would probably have been taken as a proof of his guilt. Criminal intercourse should not be inferred from the existence of a gonorrhœal discharge, unless signs of violence, or other corroborative proofs, are present.

2. RAPE ON YOUNG FEMALES AFTER PUBERTY

The remarks made as to the evidence obtainable from signs of violence in connection with rapes on young children apply equally to this section.

The signs of virginity.—In a virgin the hymen, in one of its forms, is nearly always present. Its common form is that of a crescent placed transversely across the entrance of the vagina, with the crescental horns towards the urethra. Occasionally the hymen is a diaphragm extending all round the orifice of the vagina, and perforated by a circular or irregular aperture, or by a vertical slit; sometimes there may be two or more apertures, or there may be no aperture at all, constituting the condition known as imperforate hymen.

With regard to the unruptured condition of the hymen being a proof of virginity, such a sign would be true in the great majority of cases ; it cannot, however, by any means be affirmed absolutely, inasmuch as the hymen may be destroyed by accident, disease, self-abuse, or by a surgical operation. Discharges due to vaginitis (not gonorrhœal in its nature) and to leucorrhœa are fairly common among girls and young women, and may be the cause of destruction of the hymen. On the other hand, the presence of an intact hymen does not necessarily prove that the female is a virgin, since women have been known to conceive, and the pregnancy has advanced to full term, and before delivery could be effected, an operation has been required for the rupture of the hymen. Normally the opening in the hymen is sufficiently wide to allow of a finger being passed into the vagina without injury to the membrane. It is, therefore, intelligible that, if the male organ be not specially voluminous, and if the aperture in the hymen be a little larger than usual, that repeated intercourse may occur without necessary rupture of that membrane. If, in addition, the hymen happen to be both tough and elastic, its rupture is still less likely to occur. Hartill¹ records the case of a girl under sixteen years of age, who alleged that she had been criminally assaulted by a man ; when examined she was found to be pregnant (probably from previous intercourse with some one other than the accused), but the appearance of the external genitals was consistent with virginity, and the hymen was perfect.

If a young female be examined four or five days after the commission of a rape, the inflammatory appearances may have disappeared ; the portions of the hymen will be seen if vaginal penetration with rupture of the membrane took place. Tears in the hymen never unite again. As a rule, the so-called *carunculæ myrtiformes* are not formed till after child-birth.

From all the facts given above, it is evident that the loss of the hymen cannot be regarded as an infallible proof of loss of chastity ; nor, on the other hand, can the existence of a hymen

¹ *Brit. Med. Jour.*, 1891.

be considered as forming absolute evidence of virginity. The presence of the hymen is generally considered as being incompatible with the idea that the female can have been delivered of a child, although it is quite possible that an abortion may take place in one of the early months of pregnancy, without necessarily involving the destruction of the hymen. Stolz¹ relates an instance of the delivery of a young woman, whose hymen was in the form of a ring or loose diaphragm open in the centre, without any alteration being produced in it; at her second delivery it was destroyed. Several instances have been recorded in which the hymen has been found uninjured in prostitutes. Maschka mentions the case of a prostitute in whom the hymen was uninjured, although complete intercourse had repeatedly taken place. Taylor and Stevenson mention three cases of women who had been living in habits of prostitution for seven, eight, and eleven years respectively, and in whom the hymen was found unruptured. Its structure in these instances accounted for its persistence. In all three it was firm and elastic, and in one of them it had almost a cartilaginous hardness. The general appearance of the genitals cannot be relied on as a sign of virginity. Duchatelet² records the case of a woman, aged fifty-one years, whose genital organs presented an almost virginal appearance, although she had been a prostitute since the age of fifteen. A perusal of these various cases shows that it may obviously be inconsistent to describe a female as 'virgo intacta' merely because the hymen is found entire.

It has been stated that most, if not all, the signs of rape may be caused by masturbation. Whilst admitting that such may possibly be the case, it should be borne in mind that in the majority of cases of habitual masturbation, the manipulations are limited to the parts in front of the hymen, and consequently that membrane is generally found intact.

¹ *Ann. d'Hyg.*, 1873.

² *La Prostitution de la Ville de Paris.*

3. RAPE ON ADULT WOMEN

Usually much less injury is inflicted by a rape on the genital organs of an adult women, or of a woman who has been accustomed to sexual intercourse. If the woman has made a vigorous resistance, there will probably be marks of violence on the body and limbs, and these should be carefully looked for in the absence of injuries to the genitals; in addition, indications of a rape are to be sought for in the presence of spermatozoa in the vagina, as emission usually occurs, although to constitute rape it is not necessary that emission should have taken place.

Conditions under which rape may be perpetrated on an adult woman.—As a general rule, a determined resistance on the part of a healthy, vigorous, adult woman would prevent the perpetration of a rape by one man. Much, however, depends on the relative physical strength of the two individuals. A strong man would probably succeed with an old or weak woman, whereas a small and feeble man could be successfully resisted by a vigorous woman. If the physical powers of the man and woman are fairly evenly balanced, or even if the woman be robust and vigorous, a rape may be perpetrated under any of the following conditions:—

1. When the woman is rendered incapable of resistance by the administration of narcotics or of intoxicating liquors.
2. When a woman falls into a condition of syncope, coma, or the so-called hypnotic state; or is rendered powerless by terror or exhaustion.
3. When there are two or more assailants against one woman.
4. When a woman yields under threats of death or duress, or from physical or moral coercion.
5. When the woman's movements are so hampered as to make effectual resistance impossible.
6. Very exceptionally when the woman is in a profound sleep.

I. *Perpetration of rape when the woman is under the influence of narcotics or of intoxicating liquors.*—When a woman accuses a man of a criminal assault upon her, and states that she was instantly rendered insensible by a handkerchief being waved in front of her face, or held to her mouth and nostrils, it may generally be taken that the accusation is a false one. A woman is not rendered instantly unconscious by an anæsthetic. Many false accusations of criminal assault have been made by women against medical men and dentists, by alleging that they have been violated whilst under the partial influence of an anæsthetic, which was being administered for the performance of some operation. Some of these charges are undoubtedly made in good faith, as a woman passing through the first stage of anæsthesia may mistake the efforts used to restrain her spasmodic or struggling movements for a forcible attempt upon her person. In some women the erotic feelings are undoubtedly excited by partial anæsthesia, and in such women the delusions which frequently attend the first stage of anæsthesia are liable to take an erotic type. In such individuals, these subjective impressions may be so vivid that they may thoroughly believe in their objectivity. In these and similar cases, the important medico-legal point to determine is whether an individual, under the partial influence of an anæsthetic, can rightly and fully recognise what is going on around her, and yet at the same time be unable to offer any resistance. Inability to offer resistance nearly always implies such a degree of anæsthesia as would produce complete unconsciousness. In these cases, in which an accusation of criminal assault is made under the conditions referred to, the woman's account should be corroborated by an examination of her person. If she decline to submit to such an examination, then the presumption is that the accusation is not a valid one. The lesson to be learnt from such cases is that a medical man or dentist should never administer an anæsthetic to a female patient without the presence of a third person. This rule should never be broken.

A somewhat remarkable case was tried in Philadelphia in

1854, and is quoted by Reese.¹ 'The plaintiff was a young lady, who charged a very respectable dentist with committing a rape upon her while in his office and under the influence of ether for the purpose of an operation upon her teeth. She averred very positively, in her testimony, that she was conscious of his entering her person and then felt pain, but she was not able to cry out or resist, and all this time was conscious of everything that was going on. She afterwards opened her eyes, and again closed them immediately. After this alleged liberty, she stated that she inhaled the ether a second time, at the dentist's request, in order to have a tooth extracted. When this was over, she made a second appointment with him for some days later. She parted with the dentist at his front door without making any complaint, leaving a kindly message for a mutual acquaintance. From his office she walked a considerable distance to a friend's house, stopping on the way at a confectioner's to partake of ice-cream. After her visit to her friend, she again walked quite a distance to another friend's house, where she remained several hours, and, after tea, on that same evening first informed anyone of the alleged outrage. On the same afternoon her catamenia appeared, it being her regular time. She stated that she did not examine her person before the appearance of the menses, nor did anybody examine her garments before two days had elapsed. She was never examined by any physician. Her complaint was lodged before the mayor, and the defendant was arrested, tried, convicted, and imprisoned for a term of years. The general opinion of the medical and legal professions, both at the time of this trial and since, was that this conviction was unjust and unwarranted by the circumstances of the case. The most serious defect in the evidence was the total absence of any medical examination to prove the recent defloration of the plaintiff.'

With regard to the question as to whether chloroform can be administered to a woman while asleep without arousing her, such administration is certainly possible, but is difficult to

¹ *Med. Jurispr. and Toxicol.*, 1891.

accomplish. In relation to a case in which it was alleged that a girl had been chloroformed during sleep and afterwards violated, Dolbeau¹ records some experiments which he made. Out of twenty-nine attempts to bring sleeping persons under the influence of chloroform, he succeeded in ten and failed in nineteen. The administration of intoxicating liquors with the object of stupefying a woman previous to her violation is not uncommon, and the drugging of alcoholic beverages with opium or morphine has been recorded. The administration of a stupefying drug or substance to a woman or girl so as to enable another person to violate the female is a punishable offence. The law is thus expressed:—

‘Any person who applies, administers to, or causes to be taken by any woman or girl any drug, matter, or thing, with intent to stupefy or overpower so as thereby to enable any person to have unlawful carnal connection with such woman or girl, shall be guilty of a misdemeanour, and being convicted thereof shall be liable at the discretion of the court to be imprisoned for any term not exceeding two years, with or without hard labour. Provided that no person shall be convicted of an offence under this section upon the evidence of one witness only, unless such witness be corroborated in some material particular by evidence implicating the accused.’—Criminal Law Amendment Act, 1885 (48 & 49 Vict., ch. 69).

II. *Perpetration of rape when the woman is in a condition of syncope, coma, or the so-called hypnotic state; or is rendered powerless by terror or exhaustion.*—A woman might be violated while in a condition of syncope or of coma, such as the post-epileptic coma. In connection with the last-mentioned condition, evidence would be required that the alleged victim was the subject of epileptic fits followed by coma. A case is narrated in Casper-Liman’s ‘Handbuch’ of a girl who was subject to epileptic fits which always left her unconscious for some hours after. A man who was acquainted with this fact on one such occasion took advantage of it, and had intercourse with her without her cognisance. Hysteria, catalepsy, and so-called hypnotism, as causes of unconsciousness during which rape may be perpetrated, must be received with great caution.

¹ *Annales d’Hygiène*, 1874.

Whilst admitting the hypothetical possibility of the violation of a woman or girl, of a certain neurotic type, while in the condition of so-called hypnotic sleep, such accounts must be regarded as very suspicious, and rather as specious excuses for non-resistance than as truthful statements. 'In giving an opinion respecting such a case, the possibility of the occurrence of hypnotic sleep, or of mental and bodily subjugation induced by suggestion, is to be admitted hypothetically, but great reserve should be maintained in accepting any such condition as accounting for the absence of resistance, or of outcry, whilst the act was being perpetrated' (Dixon Mann).

A woman, and especially a weak woman, may be so terrified by the violence of her assailant that she may be unable to offer an effectual resistance, owing to exhaustion and terror combined.

III. *Perpetration of rape when there are two or more assailants against one woman.*—It is obvious that the attempts of a woman to resist may be restrained when she is held down by an accomplice or accomplices of the violator. Several such cases have occurred.

IV. *Perpetration of rape when a woman yields under threats of death or duress, or from physical or moral coercion.*—In any of these cases the yielding or consent of the woman does not excuse the crime. The threatened violence need not necessarily be directed to the woman. Maschka¹ records a case where the violator seized the infant of the woman, and threatened to dash its brains out unless she yielded; the maternal instincts of the terrified woman made her submit. In this case, though no physical force was resorted to, intercourse was effected against the woman's will while under the influence of strong moral coercion.

V. *Perpetration of rape when the woman's movements are so hampered as to make effectual resistance impossible.*—Casper mentions a case in which a woman was rendered powerless, and probably partially suffocated, by having her clothes thrown

¹ *Handbuch*, Bd. 3.

over her head when on the ground ; in this position she was violated by the man.

VI. *Perpetration of rape when the woman is in a profound sleep.*—Although such cases are very exceptional, yet their possibility must be admitted, at all events in the case of women accustomed to sexual intercourse. Cases have been recorded in which such women have been violated, with complete vaginal penetration, during sleep. The question, however, requires very different consideration when it is alleged that rape was perpetrated on a virgin during natural sleep. Since the mere introduction of the penis within the vulva can constitute rape, the possibility of a virgin being violated during natural sleep must be admitted, though corroborative evidence of the act would be required. The full vaginal penetration of a virgin, without her knowledge, during natural sleep, by an adult man of average sexual development, may, however, be confidently denied.

Pregnancy as a result of rape.—This matter requires but very brief consideration. Undoubtedly pregnancy may follow a rape, as conception is not in any way influenced by the intercourse being voluntary or not. Formerly it was doubted whether pregnancy could result from a rape, and in a case of alleged rape the fact of subsequent pregnancy has even been alleged as indicating consent on the part of the female. Such an inference is absolutely wrong. Ovulation is not dependent on the volition of the woman, neither is the action of the spermatozoa on the ovum.

MEDICAL EXAMINATION IN CASES OF ALLEGED RAPE

In a case of alleged rape, it is the duty of a medical practitioner, before examining the genital organs of a female, to obtain her free consent. This subject has already been fully referred to (see pp. 152, 153), but it cannot be too clearly understood by medical men that an examination of the genitals of a female made without consent constitutes an indecent assault. Moreover, a civil action for damages can also be instituted.

As a thorough examination of the genital organs should be made, the female should be placed in the lithotomy position, or upon her back on a couch with the thighs widely separated; the labia can then be freely separated, and the hymen being put upon the stretch, slight injuries to it are rendered more evident. In young children, who have received injuries to the genital organs, this separation of the thighs and of the labia may cause so much pain and spasm of the muscles as to render the examination extremely difficult; in such a case, it may be necessary to make the examination while the child is under the influence of an anæsthetic, or to locally anæsthetise the painful parts by applying a solution of cocaine hydrochlorate. The objection to the latter plan is that, if the parts are lacerated, the cocaine solution is rapidly absorbed, and is then liable to produce toxic effects.

Careful notes should be made of the various injuries found and of their extent. Specimens of the mucus from the vagina and vulva should be removed with a glass rod or silver spatula and examined with the microscope for spermatozoa. The thighs, wrists, neck, and body generally should be examined for bruises, scratches, and other signs of violence. The clothing, and especially the underclothing, should be examined for blood stains and seminal stains; if stains are found, the portions of clothing should be cut out, and reserved for subsequent examination. Seminal stains are almost colourless, but, if dry, cause a stiffening of the stained part. The condition of the clothing as regards tears, or signs indicative of a struggle, should be carefully noted. If blood stains are found on the clothing, or if blood be found about the genitals, the question of present or recent menstruation must be solved.

Examination of the alleged assailant.—If the accused person be in custody an examination of his clothing and person may be required. The examination of the generative organs of a man can only be made with his free consent, and must on no account be proceeded with unless this is obtained. The law does not force a man to furnish evidence against himself, and

it is, therefore, only just to caution a man, previous to his giving his consent, that though the result of the examination may be in his favour, yet evidence may be obtained from it which will be used against him. In the examination of the male the points to which attention should be directed are—the presence of blood under the prepuce and about the frænum; scratches on the hands, face, and person generally; the presence of blood stains and seminal stains on the person and clothing; any long hairs on the clothing, which should be kept for comparison with the hair of the alleged victim; any tears or other marks of violence on the clothing; the presence of soil, mud, or grass on the boots, any of which, if found, should be compared with the soil of the spot at which the alleged rape is stated to have been perpetrated.

EXAMINATION OF SEMINAL STAINS

The detection of spermatozoa is frequently of great use in furnishing evidence of the commission of rape, but it is not absolutely required as proof of the crime, since proof of penetration, and not of emission, is all that is demanded by the law of England.

To ascertain whether spermatozoa are present in the mucus removed from the vulva or vagina, a small quantity is placed on a microscope slide, covered with a thin cover-glass, and examined with a quarter-inch to one-sixth inch objective. Dried seminal stains on fabrics cause a stiffening of the fabric at the spot, and require softening before the spermatozoa can be detached. Care should be taken not to handle the stained portions of fabric more than is absolutely necessary, and not to bend or fold them, in order to avoid separation of the heads and filaments of the spermatozoa. The fluid employed for softening the stain should be one that will not cause undue swelling of the spermatozoa; a very dilute solution of hydrochloric acid in distilled water—one drop of acid to 40 c.c. of water—is recommended by Ungar. A few drops of the acidulated water are placed in a watch-glass, and a strip of

the stained fabric is allowed to dip with one end in the fluid, and kept there until the albumen is thoroughly softened; this will take from a few minutes to four or five hours, according to the age of the stain. The strip of fabric is then removed with forceps and gently dabbed firstly on a microscope slide, and then on a thin cover-glass. The portion left on the microscope slide is covered with another thin cover-glass and examined at once with the microscope for spermatozoa. The portion left on the cover-glass is to be dried and examined by Ungar's method of double staining.

After the deposit has dried at the normal temperature, the cover-glass, held by forceps, is rapidly passed (deposit side upwards) over a spirit or Bunsen flame so as to harden the deposit; when cold, it is floated (deposit side downwards) on a solution of eosine in a watch-glass; the solution consists of eosine 0.025 gramme, alcohol 30 c.c., and distilled water 70 c.c. The cover-

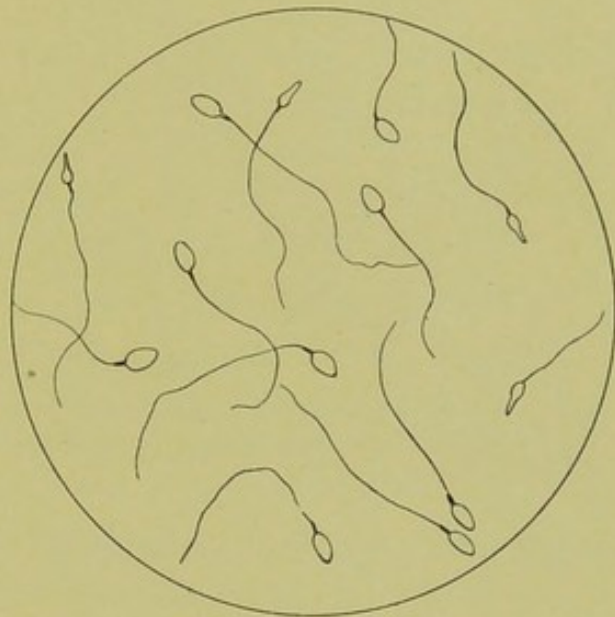


FIG. 31.—HUMAN SPERMATOZOA
(Magnified 680 diameters)

glass is allowed to remain in the eosine solution for an hour, and is then removed, drained, allowed to dry, and lightly washed with weak alcohol (one part alcohol to two parts water); it is then placed in a solution of logwood until stained, a period varying from a few minutes to an hour or more, after which it is washed, mounted in the usual manner, and examined with the microscope. The back part of the head of each spermatozoon is stained dark blue, whilst the remainder of the head and the filament are stained an intense red. Another and simpler method recommended by

Dixon Mann¹ is to combine the softening and staining solutions in one. A solution of methyl green, 0·15 to 0·3 gramme in 100 c.c. of distilled water, is acidified with five drops of hydro-



FIG. 32.—HUMAN SPERMATOOZOA
From a stain twelve days old; obtained
by the methyl-green process (Magnified
680 diameters)

chloric acid, and the strip of fabric with the seminal stain is allowed to dip into a few drops of it in a watch-glass, and to remain for several hours. The strip is then removed and gently dabbed on a microscope slide; the deposit may be examined at once in the moist state.

Spermatozoa have been known to retain life and activity for eight days in the vaginal mucus. In seminal stains they retain their form for an indefinite

period, and have been recognised in stains several years old.

It should be borne in mind that very exceptionally, in morbid states of the vaginal mucus where cleanliness is not

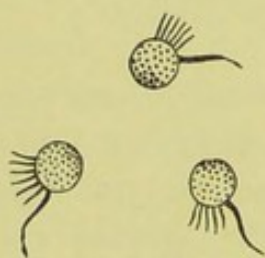


FIG. 33.—TRICHOMONAS
VAGINÆ
(Magnified 680 diameters)

observed, a microscopic organism has been found; this is *trichomonas vaginæ*. Reference to figs. 31, 32, and 33 will demonstrate the impossibility of their being mistaken for spermatozoa by anyone accustomed to the appearances of the latter; the head of the trichomonas is about three times as large as that of the spermatozoon; it is granular and armed with ciliæ, whilst the filament is very much shorter than that of the spermatozoon.

¹ *Forensic Med. and Toxicol.*

UNNATURAL SEXUAL OFFENCES

This form of crime is unfortunately much more common than is generally supposed; the reports of trials of cases of inverted and perverted sexual actions are not generally made public, and, in addition, the cases that come before the courts of law form but a small fraction of those actually occurring. Unnatural sexual offences comprise *sodomy*, *pederastia*, and *bestiality*.

Sodomy means unnatural sexual intercourse between two human beings usually of the male sex. **Pederastia** (παιδὸς ἐραστῆς, love of a boy) is that form of sodomy in which the passive agent is a boy. **Bestiality** means sexual intercourse between mankind and the lower animals.

The Act (24 & 25 Vict., ch. 100), in naming the punishment to be meted out for these crimes, states, 'Whosoever shall be convicted of the abominable crime of buggery, committed either with mankind, or with any animal, shall be liable, &c.' In one case (*Rex v. Wiseman*) a man was indicted for having committed this offence with a woman, and the majority of the judges held that this was within the statute.

In some cases, no doubt, a congenital perversion of the sexual instincts exists, so that a man may be physically a man and psychically a woman, and a woman may be physically a woman and psychically a man. A man who is psychically a woman, though his sexual organs may be perfect, will have no sexual feelings towards a woman, but will have a strong liking for the society of his own sex.

In a case of sodomy both the passive and active agents are equally guilty, except when the passive agent was not consenting, such as when overcome by force, or by being drugged, or from being an idiot or lunatic, or when the passive agent is under fourteen years of age. The perpetration of sodomy on a man against his will, or during natural sleep, is contrary to all probability. As a rule, the facts of this crime are proved

without medical evidence, except in the case of the passive agent being a boy, when marks of physical violence may be apparent.

Signs of sodomy.—The active agent shows no signs of the habit. The passive agent, if he has long been accustomed to the habit, may show certain signs, which, however, are by no means constant. These are a funnel-shaped depression or involution of the soft parts around the anus, a patulous state of the anus, with an absence of the puckered state of the skin around, and in recent cases in young boys tears of the sphincter ani, or of the mucous membrane of the rectum, may be found.

Bestiality.—This term is applied to unnatural sexual intercourse between mankind and the lower animals. Usually the unnatural intercourse takes place with mares, cows, and sows, but bestiality with much smaller animals has occurred. In *Reg. v. Miles* (Ipswich Spring Ass., 1893) the prisoner, an adult man, was convicted of bestiality on two occasions with a female rabbit and a hen fowl respectively; the cloaca of the hen was found lacerated through into the peritoneal cavity, within which spermatozoa were found.

INSANITY

CHAPTER XL

Insanity - Causes - Classification - Diagnosis - Hallucinations, illusions and delusions - Mania - Melancholia - Dementia - Delusional insanity - Moral insanity - Impulsive insanity - General paralysis of the insane - Epileptic insanity - Periodical insanity - Insanity in relation to child-bearing - Toxic insanity - Idiocy.

It is not proposed to enter into a full discussion of the subject of insanity in this book. The medico-legal relations of insanity will be fully considered, together with the methods of determining its existence and degree; the important question of the civil and criminal responsibility of the insane will be discussed, and directions will be given as to the legal obligations devolving on medical practitioners in connection with the certification of persons of unsound mind, for the purpose of placing them under restraint.

Definitions.—From the point of view of the physician, insanity must be regarded as a disease of the brain or a disorder of the mind, apart from the consideration of the responsibility of the individual. The medical jurist, however, has to consider the important question of responsibility. No satisfactory definition of insanity, which includes all forms of unsoundness of mind, can be given; this is not surprising when it is remembered that mental disorder varies in its degree as well as in its characters, and that no two cases are precisely similar. The common notion of insanity is that it necessarily consists

in an entire deprivation of reason; this, however, is incorrect, as the insane certainly reason upon their feelings and impressions. Savage considers that no standard of sanity can under any circumstances be considered definitely to exist. 'Sanity and insanity, as recognised by the doctor, and, in fact, by the general public, must be but terms of convenience. No person is perfectly sane in all his mental faculties, any more than he is perfectly healthy in body. A man, in fact, must be considered as sane or insane in relation to himself. The old and oft-repeated statement that insanity is a perversion of the *ego* is absolutely true. Sanity and insanity, then, are to be measured by differences or changes of habit, taste, and disposition in the individual, as well as by other symptoms of change in the nervous centres' (Savage¹). Bucknill and Tuke define insanity as 'a disease of the brain (idiopathic or sympathetic) affecting the integrity of the mind, whether marked by intellectual or emotional disorder, such affection not being the mere symptom or immediate result of fever or poison.' The indication of insanity, as required by law, is not so much the proof of the existence of delusion in the mind of a person, as the proof that such a person is either incapable of managing his or her affairs with ordinary propriety, or is liable to endanger his own life or the lives of those around him. Insanity may be either congenital or acquired. In *congenital insanity* the mental powers or moral character are, from the first, much below the average standard at the same age. In *acquired insanity* the original character of the person becomes morbidly altered.

Causes of insanity.—These are divided into the predisposing and the exciting causes. The principal predisposing causes of insanity are the following: (i) *Sex*.—There is a rather larger proportion of cases of insanity among males than among females. (ii) *Age*.—The tendency to insanity increases with the development and employment of brain and mind. The

¹ *Insanity and Allied Neuroses*.

greater number of cases arise in the period between twenty-five and forty years of age. (iii) *Heredity*.—An inherited tendency to neurotic disorder is a great predisposing as well as exciting cause of insanity. (iv) *Condition of life*.—Insanity is more common among civilised than barbarous races, but the vices and failures of civilisation are responsible for this greater proportion. Poverty and bad hygienic surroundings and excessive alcoholic drinking are among the conditions of life that predispose to insanity.

The exciting causes of insanity may be divided into physical and moral causes.

EXCITING CAUSES OF INSANITY

Physical causes	Moral causes
Heredity	Mental anxiety
Intemperance	Worry
Organic brain disease	Overwork
Injury to head	Pecuniary losses
Epilepsy	Religious excitement
Venereal excesses and venereal disease	Love affairs (especially if accompanied by seduction)
Masturbation	Domestic trials
Ovarian and uterine ailments	Fright
Pregnancy	Other emotions
Parturition	
Lactation	
Fevers	
Lead and other poisons	
Congenital defects (especially of the senses)	

Classification.—Various classifications of the different types of insanity have been attempted, but most of them are open to the objection of fostering the tendency to regard each class as a distinct disorder. Savage classifies the different forms of insanity according to age occurrence—viz. insanity of early development, of childhood, of adolescence, of maturity, of climacteric, and of old age.

The following is the nomenclature and classification adopted

by the Committee of the Royal College of Physicians, London, 1885:—

Mania	Senile insanity
Melancholia	Toxic insanity, from alcohol, gout, lead, &c.
Dementia, including acquired imbecility	Delirium tremens
Idiocy (congenital imbecility)	Traumatic insanity
General paralysis of the insane	Insanity associated with obvious morbid change or changes in the brain
Puerperal insanity	Consecutive insanity from fevers, visceral inflammations, &c.
Epileptic insanity	
Insanity of puberty	
Climacteric insanity	

The following are the principal types of insanity:—(i) **Maniacal states**.—The association of mental weakness with loss of control. (ii) **Melancholic states**.—The association of mental weakness with excessive self-consciousness. (iii) **Delusional insanity**.—In this form the patient is misled by false sense impressions. (iv) **Dementia**.—A combination of mental weakness with defect in the mental functions. (v) **Idiocy**.—A deficiency of the mental faculties, either congenital or acquired very early in life. (vi) **States of weak-mindedness**.

INDICATIONS AND DIAGNOSIS OF INSANITY

There are many difficulties that may present themselves in connection with the diagnosis of an alleged mental disorder. It may be feigned, or the real disorder may be artfully concealed, or there may be considerable difficulty, or even impossibility, in discovering the motive of some extraordinary action. Although the absence of all rational motive generally indicates an insane act, yet, in any particular case, its absence must not be too readily inferred, since the motive may be most artfully and successfully concealed. The duties of the medical jurist in connection with a case of insanity relate to the questions of (a) the *civil responsibility* of the individual, and (b) his *criminal responsibility*.

Civil responsibility means the capability of an individual to manage his own affairs with propriety, and to conduct the

ordinary duties and affairs of civil life according to the usual social rules. The question of civil responsibility is specially raised in connection with the making of wills and entering into contracts.

Criminal responsibility refers only to criminal acts, and raises the question as to whether an individual, at the time of the commission of some particular crime, was or was not in such a mental condition as to render him responsible for the act.

The onset of insanity may be sudden or gradual. If it begin very insidiously, the first noticeable change is frequently an alteration in temperament; the emotions become affected before the mind is impaired, and the individual is different to what he formerly was. Either he becomes more quiet and dull than usual, or, on the other hand, more restless, excitable, or noisy. The dulness may deepen to gloom and despondency, which may alternate with periods of excitement. The degree of excitement varies considerably, and may be accompanied by outbursts of gaiety, or of anger and violence, which appear to be uncontrollable by the will. This change in the disposition of the individual generally lasts some time before delusions are discoverable, and is generally apparent to members of his own family before it is noticed by others. The outbursts of irritability or anger are called forth by the most trifling circumstances, and are generally associated with extreme impatience of contradiction. The feelings of the patient become reflected in his acts. He either looks upon everything despondingly, and neglects his duties and amusements, or, on the other hand, he conducts his business rashly and foolishly, is extravagant, and may indulge in drinking or frivolous pursuits. The emotions frequently change, so that the individual may acquire a dislike or hatred for persons to whom he was formerly attached. This condition is generally accompanied by suspicion of one or more individuals around him, the suspicion generally taking the form of an idea that there is a conspiracy against his person, property, or liberty. These emotional changes and

suspicious react on the mind so as to produce interference with the reasoning processes and judgment, and sooner or later delusions and hallucinations follow. If the gloom and despondency increase, and corresponding delusions present themselves, the patient passes into *melancholia*. If the restlessness and excitability increase, and are followed by corresponding delusions, the patient passes into a condition of *mania*. If the patient lapse into a fatuous or childish condition, his state is that of *dementia*; if he pass at once into this condition, it is called *acute* or *primary dementia*; if, on the other hand, he gradually pass into it, after perhaps years of brain-disease or insanity, it is called *chronic* or *secondary dementia*.

The symptoms previously described are the mental ones of a commencing attack of insanity, but, in addition, a bodily symptom, sleeplessness, generally ushers in every form of insanity. According to the severity of the attack, sleep may be deficient for some time, or may be altogether absent for days. The sleeplessness is frequently accompanied by heat and pain of the head, indicating a disturbance of the cerebral circulation.

Examination of a supposed insane patient.—The usual physical examination into the state of the alimentary, circulatory, respiratory, and genito-urinary systems should be made. During this examination the demeanour, gestures, actions, and dress of the patient should be noticed. Enquiries should be made as to sleep, pain, &c., and questions should be put to test the memory, and to ascertain the existence or not of delusions. If enfeeblement of the intellect appear to be present, its extent may be ascertained by putting simple questions, such as asking him his age, occupation, the number of members of his family, the day of the week, the month, and the year. In cases of suspected delusional insanity these simple questions may cause irritation; the patient should then be led on to general conversation about his occupation, prospects, his friends and enemies, and his feelings on religious matters. Delusions and hallucinations should be sought for,

and it should be especially ascertained whether the patient hears 'voices,' or suffers from visual hallucinations.

HALLUCINATIONS, ILLUSIONS, AND DELUSIONS

A **hallucination** is the production of a sensory image in the absence of a sensory impression, or, in other words, it is a perception without an object. A hallucination does not necessarily indicate insanity, inasmuch as the reasoning faculties may reject the reality of it; if, however, it be accepted by the reasoning faculties as a reality, then it determines a delusion, and is indicative of a disordered intellect. Hallucinations are most frequently met with in delusional insanity, melancholia, and mania. Hallucinations may be auditory, visual, gustatory, olfactory, and tactual or cutaneous. *Auditory hallucinations* are more frequent than those of any of the other senses. They may range from such imaginary noises as buzzings or thumpings in the ears, to more highly differentiated imaginary sounds, such as 'voices' or the ringing of bells. Auditory hallucinations are very common in delusional insanity, but may occur in almost any of the other forms of insanity. *Visual hallucinations* occur next in frequency to those of hearing. They may range from mere blurs or haloes around objects, to flashes of light or colour, or to faces and figures of persons or animals. They are especially frequent in acute delirious mania and delirium tremens. *Gustatory hallucinations* come next in frequency, though they occur much less often than those of sight. They usually take the form of suspicion of poison in food, and are most frequently observed in persecutory delusional insanity. *Olfactory hallucinations*, according to Greisinger, belong chiefly to the early stages of insanity. They generally co-exist with those of taste. They are common in hypochondriacal melancholia, in general paralysis of the insane, and in masturbatory insanity. *Tactual or cutaneous hallucinations* occur least frequently. Patients complain of vermin crawling on the skin, or of the application of

irritating substances, or of feeling electric shocks. They are commonest in climacteric insanity and in melancholia. In one sense hallucinations are not creations, but are reproductions of something received before and stored in the memory. For instance, an individual who has been blind from birth could not suffer from visual hallucinations; a person born deaf, and remaining so, could not suffer from auditory hallucinations.

An **illusion** is the production of an erroneous sensory image by an actual sensory impression; or, in other words, it is a false perception of an external impression. Illusions may be experienced without participation of the intellect, and sane persons may be the subjects of them. An appeal to the reasoning faculties will, in the case of the sane, correct the illusion. In the case of the insane, an illusion may determine a delusion, and then indicates a disordered mind. The following are a few illustrations of illusions: A timid individual may mistake, in partial darkness, a post for a man, or a tombstone for a ghost, or the drapery of the bed curtains for a ghost; a maniacal or delirious person hearing some noise in the room may interpret it as the voice of a friend or enemy. If, however, a person hears a voice where no sound has been produced, he is the subject of an auditory hallucination.

A **delusion** is a false idea, notion, or fancy. As defined by Spitzka it is a 'faulty idea growing out of a perversion or weakening of the logical apparatus.' A legal definition of a delusion is given by Shaw¹:—A faulty belief, out of which the subject cannot be reasoned by adequate methods for the time being. The following are a few examples of delusions:—A man imagining that he is God or some monarch; a pauper imagining himself a millionaire; a rich man imagining himself a beggar; a man imagining that he is being persecuted; a man imagining himself made of glass or china. All delusions of a personal nature, like those just mentioned, are indicative of mental disturbance. Individuals may, however, labour under impersonal delusions, such as some having reference to the

¹ *Epitome of Mental Diseases.*

religious state, without their responsibility being necessarily destroyed, and therefore without their being insane. In legal matters the question of responsibility depends upon the connection of the act with the particular delusion; apart from the delusion, the individual may appear to be in a sound mental condition. It should be remembered that the insane frequently display remarkable cunning in concealing their delusions. As illustrative of this, the late Lord Erskine was engaged in a case in which a lunatic had brought an action for false imprisonment. The man was closely questioned by Lord Erskine for nearly the whole day without anything being elicited to prove his delusions, when a gentleman came into court and suggested to the counsel that the man believed himself to be Jesus Christ. Acting upon this hint, Lord Erskine addressed the man with profound reverence, and apologised for his former want of respect. The man at once expressed his forgiveness, and, with the utmost gravity, said, 'Yes, I am the Christ.'

Relations of insanity and jurisprudence.—The legal view of insanity is much more restricted than the medical. A lawyer considers insanity only in so far as it affects the safety of person or the preservation of property. Sir James Stephen says: 'A lawyer, when speaking of insanity, means conduct of a certain character; a physician means a certain disease, one of the effects of which is to produce such conduct.' In other words, a physician has to deal with the condition of certain persons, while the lawyer has to deal with the nature or quality of certain acts. The following are the conditions under which unsoundness of mind comes into relation with the law:—(i) When the mental condition of an individual is such that it is necessary for his welfare, or for the safety of the public, that he should be placed under restraint. (ii) When a person suffers from such unsoundness of mind that he is incapable of managing himself or his affairs. (iii) When irresponsibility for a particular crime, on account of insanity, is pleaded in a court of law. These three relations of insanity to jurisprudence will be considered later on.

Lucid intervals.—In a legal sense, the expression 'lucid interval' means a temporary intermission or cessation of the insanity, during which the reasoning power is recovered. In a remission there is merely an abatement of the symptoms, or a change in the degree of the insanity. In connection with a lucid interval the law does not require proof that the attack will never return, since, obviously, such proof could not be obtained at the time, and, moreover, the predisposition to an attack of unsoundness of mind is certainly greater in a person who has recovered from an attack of insanity than in one who has always been perfectly sane. The duration of a lucid interval is uncertain; it may last from a few minutes to years. Lucid intervals sometimes appear suddenly in the insane; the individual may be conscious of the sudden restoration to mental soundness, and may fully recognise the absurdity of the delusion which he previously entertained. Lucid intervals most frequently occur in cases of mania, monomania, and occasionally in dementia, when not chronic. They are never met with in cases of idiocy and imbecility.

During a lucid interval, the law recognises the power of the individual to make a will, to enter into a contract, and generally to exercise his civil rights. It has also been said that a person is to be considered responsible for a crime or crimes committed during a lucid interval. There is, however, generally an indisposition on the part of a jury to convict a person of a crime if it can be proved that the person was really insane within a short period of the time of its perpetration. There is always the possibility that during a so-called lucid interval some mental unsoundness remained, and this possibility becomes a probability if the interval has been a very short one.

A short description of the more important forms of insanity, and the symptoms by which they may be recognised, will now be given.

MANIA

Mania is a condition of mental weakness with unreasonable loss of self-control. Under this heading *acute delirious mania*, *acute mania*, and *chronic mania* will be described.

Acute delirious mania.—In acute delirious mania, or maniacal delirium, there is frequently insane inheritance; the maniacal outbreak is often sudden, and may occur after very few and very short premonitory symptoms. The attack may be caused by some sudden mental shock, such as grief, or a severe misfortune or disappointment, or it may occur in the course or decline of an acute disease, such as a fever or pneumonia. The attack is much graver than in the case of ordinary mania, and, as a rule, runs a shorter and more defined course; sleeplessness is more constant, and the language is more incoherent; a fatal issue frequently occurs. If death does not happen, the acuteness of the attack gradually declines, and then recovery usually takes place. Occasionally acute delirious mania is preceded by a period of depression, followed by loquaciousness; when it develops in this way, its duration is likely to be longer than when it occurs suddenly without preceding mental disturbance.

Symptoms.—Maniacal excitement is violent and continuous; the patient is constantly moving his limbs, and is shouting and talking in a most incoherent manner. As a rule, he is not violent to those about him, though he may be in terror of them, and may resist all attentions; frequently he is troubled with terrifying hallucinations, which render the prognosis unfavourable, or, occasionally, he may be hilarious, which is a better sign. Towards the termination of the disease, when the temperature has reached its maximum, the maniacal excitement passes away, and is succeeded by depression, and sometimes by fatal coma. The face is of a pale earthy colour, the lips and teeth are covered with sordes, the tongue is dry and blackish in colour, and the breath is offensive. There is great thirst, anorexia, and obstinate constipation. The temperature

oscillates between 101° F. and 103° F.; the pulse is frequent, small, and irregular. The urine is often retained for a long time, and is then passed involuntarily. A high temperature, with very rapid pulse, and panting respiration are bad signs. The distinguishing characters of the disease are the increased temperature, the delirium with hallucinations, the sleeplessness, and the not unfrequent fatal issue.

Acute delirious mania may be distinguished from ordinary delirium by the latter being a result of bodily disease, whereas a disordered state of the mind is the first symptom of the former. Meningitis and encephalitis may be distinguished from acute delirious mania, by the mode of attack; in the former affections there are severe pains in the head, vomiting, rigors, and intolerance of light and sound.

Acute mania.—This form of insanity generally comes on slowly, although it may begin quite suddenly, as after a violent moral shock. It may be preceded by and evolved from a delusion, or emotional or intellectual exaltations and perversions, or from alterations of habit, appetite, and propensity. Cases of acute mania have been grouped by Savage¹ thus:—
 (i) Acute mania may be the whole of the disordered process.
 (ii) It may be part of a more complex form of insanity, such as a stage in recurrent mania, or in *folie circulaire*. (iii) It may be a symptom of general paralysis of the insane. (iv) It may be a concomitant of epilepsy, following or replacing a fit.
 (v) It may be the further development of a delirium due to fever or alcohol. (vi) It may replace some other neurosis, such as asthma or hysteria. Acute mania occurs most frequently at the periods of adult and mature life, but may occasionally take place at either extreme of age.

Symptoms.—The premonitory symptoms usually consist of a confused feeling in the head, headaches, unrest of body and mind, a sinking sensation in the region of the stomach, with an undefined dread that something will happen; the patient may be seized with a desire to commit some violence. The

¹ *Insanity and Allied Neuroses.*

sleep is usually disturbed, and accompanied by unpleasant dreams. The restlessness and irritability increase, the tongue becomes coated, and the breath offensive. With the developed stage of the disease the manner changes; the patient becomes boisterous, sometimes laughing, or scolding, or swearing. He may be subject to hallucinations, illusions, and delusions, the latter frequently being of an exalted nature; he shuns those with whom he was formerly most intimate, disliking those whom he formerly liked and trusted. The patient is restless by day, and frequently sleepless by night; the face is flushed. The hair, at times, assumes what has been called an electrical condition. Visual and auditory hallucinations are common; the visions, as a rule, constantly change, and the supposed voices of friends or acquaintances are heard. The actions of acute maniacs frequently depend upon their hallucinations. Ideas course through the mind without apparent order or connection, and to the casual observer the patient has lost all control over his thoughts. Ideas and words are, however, linked together in the mind. 'There are two distinct methods of combination, the verbal and the ideational, so that one patient, hearing a tinkle of a bell, at once begins rhyming with words like bell, tell, fell, knell, and hell. Another, seeing a ring upon one's finger, rapidly passes from ring to fling and sing, with many more verbal associations. But another way of association is by similarity of ideas, so that a person's name suggesting a fish, the patient rapidly passes from whelks to oysters, shell-fish, garden-snails, and fishery exhibitions. Probably the most common is to have a combination of both methods, as when a woman, seeing a hat, instantly said cat, mouse-trap, kittens; the association being first hat and cat—verbal, and next mouse-trap and kittens—ideational.' (Savage.¹) The incoherent ravings of acute mania are possibly rather due to rapid change of ideas than to the thoughts being entirely disconnected. Patients suffering from acute mania are very destructive and mischievous, frequently tearing up their

¹ *Insanity and Allied Neuroses.*

clothing and bedding, and breaking windows, furniture, and ornaments. Acute mania is not usually fatal, unless some other disease occur as a complication; generally the patient either recovers, or lapses into chronic mania or dementia. Attacks of mania are frequently recurrent, and the period of excitement is often followed by one of depression.

Chronic mania.—Acute and sub-acute mania may pass into the chronic condition; chronic mania is also frequently a stage on the way to dementia. The principal symptoms of chronic mania are restlessness, want of self-control, weakness of memory and of judgment, sleeplessness, want of affection, destructiveness, and sometimes hallucinations and delusions.

Monomania.—This term is applied to that condition in which the mental aberration is shown in one direction only, the mental disorder being confined to one subject or to one class of subjects. Apart from his special delusion, the monomaniac may appear to control his thoughts and actions like a sane person, but most probably all the mental faculties are affected to a certain extent. Monomania frequently assumes one of two forms, the thoughts being either gay and cheerful, or melancholic. The subject of monomania will be treated more fully in connection with delusional insanity, moral insanity, and impulsive insanity (see pp. 293-300).

MELANCHOLIA

Melancholia is a condition of mental weakness, associated with excessive self-consciousness. It is characterised by mental depression, the depression being altogether out of proportion to the apparent cause, and is frequently accompanied by delusions. Melancholia may be a stage of a mental disorder, or it may alone constitute the disordered mental condition. In *hypochondriacal melancholia* the excessive self-consciousness is manifested on the bodily side, and the delusions especially refer to the head, or to the digestive tract, or to the reproductive organs; in *melancholia* the excessive self-consciousness is manifested on the mental side. Melancholia rarely begins

suddenly. In nearly all patients it commences with lowness of spirits, and lack of interest in the occupations and amusements of daily life. The patient becomes imbued with a vague feeling of oppression and dread, which generally merges into a fixed delusion. As a rule, the subjects of melancholia can talk and argue more or less rationally on matters not connected with their special delusions. Melancholia may suddenly pass off, or it may gradually clear up, or it may merge into dementia, or it may end fatally. Savage¹ remarks that 'a certain number of young cases die of *broken heart*; and I suppose the best way of describing this mode of death is to call it simple melancholia.' For simplicity of description, melancholia may be divided into the following groups:—*Simple melancholia*, *hypochondriacal melancholia*, *delusional melancholia*, *active or agitated melancholia*, and *melancholia with stupor*.

Simple melancholia.—The mental symptoms consist of a feeling of profound depression and inability to do anything. The patient may be irritable if disturbed, and may dislike the society of relatives or friends; or he may show discontent, or apathy, or complete self-absorption. He may sit quite mute, or may make monotonously reiterated complaints. The melancholic patient is peculiarly egotistical, fancying that he is the only one who has endured such suffering, or who has passed through such experiences, 'dreaming dreams no mortal ever dared to dream before'; he is also extremely self-conscious, or wrapped up in himself. Melancholic patients are very apt to commit suicide, especially in the early stage of the disease. According to Savage, the most suicidal patients are those who believe they are to be injured.

The principal physical symptoms are, a generally sallow appearance of the skin, a flabby and frequently tremulous tongue, bad appetite, imperfect digestion, constipation, and general impairment of nutrition. Refusal to take food is very common. The circulation is feeble, and respiration is slowed. One of the most prominent symptoms is sleeplessness. Usually

¹ *Insanity and Allied Neuroses.*

the patient is averse to movement of any kind, and remains with the eyes fixed on the ground. Headache is frequently complained of.

Hypochondriacal melancholia.—In this form the patient is extremely dejected and self-conscious, and may pass on to despair and loss of self-control. At first he is usually very loquacious on the subject of his supposed affection or illness, but, as a rule, does not care to converse on other topics. Later, he may become dull and morose, and the will is enfeebled. He is subject to illusions, misinterpreting what is presented to his senses, but is not subject to hallucinations. Savage describes three classes of sufferers from this form of melancholia:—(i) Those who complain of brain-working or brain-loss, such as complaints of strange sensations at the top of the head and in the brain, or of the brain being dried up or changed in some way. (ii) Those who complain of some trouble in connection with the gastrointestinal tract, such as a sensation that the food passes from the gullet into a cloacal cavity, or direct into the circulatory system, or that the bowels are obstructed. (iii) Those who believe that there are some defects in their reproductive organs, such as impotence.

Delusional melancholia.—This form is far more common than simple melancholia. The majority of the patients are elderly. Climacteric insanity is usually melancholia. Delusions constitute the most prominent mental symptoms. The delusions are very various, such as the patient being the subject of syphilis or of some skin disease; the patient being unworthy to eat; the belief that some unpardonable sin has been committed; the idea that poison is being administered. With reference to what is meant by 'the unpardonable sin,' a different meaning is doubtless attached to it by different patients. In some cases it refers to some form of sexual abuse; in others to what they consider has been blasphemy against the Holy Ghost.

Active or agitated melancholia.—This form is characterised by physical restlessness, the movements as well as the expres-

sion of the thoughts having but little variety. Some patients keep up a perpetual motion, such as constantly wringing the hands, or picking the fingers, or rocking the body, or pulling out the hair, or moaning, or breaking out into frequent fits of weeping; other patients may be constantly hurrying to and fro. It occurs mostly in adults and elderly people. In the majority of cases, these patients suffer from simple delusions, but occasionally they have visual or auditory hallucinations.

Melancholia with stupor.—In this form of melancholia the patient mainly remains in one position and attitude, the countenance generally being expressive of misery or terror. He resists being moved, and refuses food. He is subject to delusions, and frequently to hallucinations; the latter may be very terrifying, and may give rise to dangerous impulses. As a rule, he remains passive and speechless. Savage believes that there are two distinct mental conditions occurring in melancholia with stupor—one in which the patient is suffering, as it were, from prolonged panic; the other in which the patient has a definite idea of an impending evil. Some of the sufferers from this form of insanity are so passive as to require to be fed, washed, and dressed, although they may actively resist the carrying out of such attentions. Notwithstanding the passive condition, the patient may be carefully watching an opportunity of committing suicide. This form of melancholia should not be confounded with primary or acute dementia. The latter occurs in young people, the former generally in persons of more advanced years. In acute dementia the symptoms come on rapidly, and without the depression and gloomy delusions of melancholia with stupor. Savage considers that the two affections may be distinguished by the retention or not of memory on recovery; that if a person recover with a recollection of misery associated with his illness, then the condition was melancholia with stupor; whereas the person suffering from acute dementia would have no such recollections.

DEMENTIA

Dementia is a condition of mental weakness accompanied by defect in mental functions; it is manifested by an enfeeblement and decay of the mental powers. It differs from mania in that it is attended by a lack of ideas, whereas mania is characterised by an exuberance of ideas, although these are confused and more or less incoherent. Dementia differs from melancholia with stupor in that the expression of the patient is that of absence of intelligence, not that of an intelligence overwhelmed with misery. Dementia may come on rapidly, when it is known as *acute primary dementia*; or slowly, when it constitutes one of the forms of *chronic* or *secondary dementia*.

Acute primary dementia.—This form comes on rapidly, without any preceding disorder, and is accompanied by a profound abeyance of all the mental faculties. The patients are chiefly under twenty years of age, and more frequently are girls. Imperfect development, bad food, chronic ill health, and masturbation are the principal predisposing causes of this form of insanity. Some mental shock, as a fright or scolding, may cause the symptoms to come on rapidly. The patient is in a state of immobility, and does nothing of his own initiative. The expression is vacant and fatuous, and the saliva dribbles from the mouth. Conversation is abolished, but there may be a repetition of some word or sentence. Sleep may be irregular, but is not absent, as in mania. The patients are wet and dirty in their habits, and have to be attended to like babies.

Chronic primary dementia.—Although this form is not secondary to previous mental affection, yet it is generally connected with previous disease of the brain. It may occur after epileptic or apoplectic attacks, or after years of drinking, or after a fright or shock. The most prominent symptom is loss of memory; other symptoms are absent-mindedness, lack of attention, omission of syllables and words in writing. Gradual intensification of these symptoms may occur until the development of complete fatuity is reached.

Secondary dementia.—Cases of secondary dementia, in which decay of the mental faculties successively occurs, and which are accompanied by progressive physical weakness, are popularly attributed to, and called, softening of the brain. The mental defect may vary from a mere loss of memory to the almost complete extinction of mind. The patient frequently cannot remember the year, the month, or the day of the week, and forgets what he has said immediately after saying it. Dementia may be secondary to physical disease, such as fevers, chronic alcoholic poisoning, and syphilis; or it may be the final stage of mania, melancholia, or epilepsy.

Senile dementia.—This form is generally marked by a failure of both the bodily and mental powers. The old man becomes cross and petulant, and exhibits loss of memory and childishness. It is not possible to assign any age-limit at which the mind begins to fail from physiological decay, as senile dementia is not a necessary accompaniment of advanced age. If signs of dementia occur before the age of sixty years, the probability is that there has been some cause other than age which has interfered with the nutrition of the brain.

STATES OF WEAK-MINDEDNESS

Mental weakness may be due to defective development, as in idiocy and imbecility; or to physiological decay, as in senile dementia; or it may be secondary to any of the forms of simple insanity or of coarse brain-lesions. A progressive decay in neurotic subjects may also give rise to states of mental weakness of various kinds.

DELUSIONAL INSANITY AND MONOMANIA

The subjects of delusional insanity are either misled by false sense impressions, or are possessed by some false and fixed idea. The mind may be misled by any one of the senses,

and any false idea may become fixed. Hallucinations of hearing are common—patients complaining of hearing voices. Hallucinations of taste and smell are also frequent, and commonly give rise to suspicion in the patient's mind that poison has been mixed with the food, or has been dissipated in the air in a gaseous form. The delusion may be of so harmless a nature, that the apparent condition of the patient may be merely that of eccentricity. It is not uncommon for the delusion either to be concealed, or for its discovery by questioning to be difficult, as a subject of delusional insanity may be able to carry on a rational conversation for a considerable time. Maudsley¹ relates the case of a commissioner who was sent to an asylum to liberate those whom he judged to have recovered. He examined an old man, who gave no indication of insanity in any way, and an order was prepared for his release to which he had to put his signature; he took the pen and wrote 'Christ.' Delusional insanity is also called monomania, and by lawyers it is sometimes termed *partial insanity*.

There are six forms of delusional insanity, viz:—(i) Suspicious. (ii) Ambitious. (iii) Persecutory. (iv) Religious. (v) Erotic. (vi) Jealous.

I. Suspicious form.—In this form the suspicions of the patient are very readily roused, and the most trivial events may appear to him to assume vast importance. The fact of a person turning round in the street, or using a pocket-handkerchief, may be taken as an intentional act of offence. A peculiar delusion that may affect a certain number of men, generally of young middle age, is that by some process their virility is being drawn off or weakened; such patients are very apt to be dangerous. In another class of cases a man may, without any reason, suspect the chastity of his wife.

II. Ambitious form, or delusional insanity with exalted ideas. Patients suffering from this form of insanity constitute the emperors, kings, queens, princes, &c. of asylums.

¹ *Responsibility in Mental Diseases.*

III. **Persecutory form.**—Delusions of persecution are the most common ones in delusional insanity. They differ from the delusions of persecution met with in melancholia in that the melancholiac believes that he is being persecuted because he is bad or weak, whereas the monomaniac generally believes that he is persecuted from motives of envy, and consequently has a feeling of exaltation of personal importance. The non-recognition of their supposed importance leads them to consider themselves the subject of persecution. Patients may fancy themselves the victims of some agency directed against them by persons to whom they vaguely refer as 'the villains.' The most common delusions are that certain persons have evil designs on the patient, or are plotting against him, or are poisoning his food, or are annoying him in various ways. If the patient discovers his supposed enemies, he may attack them, or hide from them, or commit suicide.

IV. **Religious form.**—This form generally commences very gradually. The patient takes a dislike to the pleasures and enjoyments of life, and is preoccupied with ideas about sin. He devotes himself to religious exercises. Sexual excitement and erotic ideas very frequently accompany these prodromal symptoms. In the developed stage the patient may believe himself to be the Messiah, or an apostle or prophet. He may have visual hallucinations, seeing angels, or auditory hallucinations, hearing the voice of God. In this condition the patient may be very dangerous.

V. **Erotic form.**—This form is not necessarily accompanied by animal sexual desire; the affection for the loved one may be quite chaste and pure. The patient is most frequently a female and evinces an affection for some person of the opposite sex, and in connection with this affection becomes possessed of delusions.

VI. **Jealous form.**—The delusion is frequently that the wife or husband, as the case may be, is unfaithful. Savage describes this form as a 'dangerous and troublesome form of delusional insanity.'

MORAL INSANITY

This is a form of insanity without absolute delusions, but which is manifested by a complete change of character and habits, and by extraordinary acts and conduct. The change is, as a rule, gradual, and may follow any of the ordinary causes of insanity. To this class belong, at all events, some of the persons who lack the power of controlling their lower instincts, and in whom the intellectual propensities are subordinated to the animal desires. The perversion of the moral perceptions may be such as to render the individual irresponsible for his actions without signs of mental disease being present—in other words, the intellect may be weakened to an extent in which the only indication of its weakening is its inability to control the moral sense. In such a case, which must be regarded as somewhat exceptional, medical evidence would not be required to determine the degree of responsibility of the affected person. Such a question could be decided on its merits by a jury of intelligent men.

Moral insanity may follow an attack of epilepsy, or may be the precursor of such attacks or of general paralysis of the insane, or may be one of the stages of *folie circulaire*.

The congenital form of moral insanity is the most difficult one to estimate. Such persons have from birth been odd and peculiar, but possess sufficient intellect, or even genius, in certain directions, to prevent them from being regarded as idiots or imbeciles. As children they frequently seem to be quite incapable of telling the truth, and are often frightfully cruel towards other children or to animals. These persons furnish many of the criminal classes, and it is frequently most difficult, if not impossible, to decide to what extent they should be considered responsible for their actions. Their parents, on one or both sides, frequently come of an insane stock, or have been the subjects of epilepsy or of alcoholism. Children of this kind sometimes get on fairly well up to the age of puberty, when, with the development of the sexual desires, they may become quite unmanageable.

IMPULSIVE INSANITY

The term *impulsive insanity* is applied to a mental disorder in which the patient is driven by a morbid and uncontrollable impulse to the commission of acts of violence, the reason being for the time overpowered. This form of insanity is not accompanied by delusions, and the acts of violence frequently take the form of suicide or homicide. Dipsomania and kleptomania are also examples. Frequently no change will have been noticed in the individual prior to the commission of the act, and consequently there is much difference of opinion as to the responsibility of the individual. In endeavouring to estimate the responsibility of such a person for an act of violence, a careful enquiry must be made into the past history of the person, and also into that of his relatives. The act itself and the manner of its commission must also be taken into consideration.

The states of morbid impulse may be momentary or constant, slight or most intense. The principal varieties of impulsive insanity are:—(i) Homicidal impulse. (ii) Suicidal impulse. (iii) Kleptomania. (iv) Pyromania. (v) Dipsomania. (vi) Destructive mania. (vii) Nymphomania. (viii) Satyriasis.

I. Homicidal impulse.—In this form of insanity the characteristic feature is an uncontrollable impulse to take life. The impulse is frequently directed to those dearest to the affected person, as when a mother develops an impulse to kill all her children. The following example of homicidal impulse is related by Maudsley.¹ Dr. Pownall, a medical practitioner, was admitted to an asylum on certificates which stated that he had made a murderous attack on his mother-in-law, whom he usually respected and loved. He had an attack of mental disorder when he was twenty-two years of age, a second after an interval of fourteen years, and a third (the one for which he was being placed under restraint) after a further interval of four years and a half. Between the attacks he successfully

¹ *Responsibility in Mental Disease.*

conducted a large medical practice, and was so much respected by his fellow-townsmen as to be elected to the office of mayor. During his second attack of derangement he shot a gentleman with whom he was out shooting, and, although the coroner's inquest resulted in a verdict of accidental death, there were some who thought differently. He remained in the asylum for four months. During the whole of that time he betrayed no symptom of mental disease, and, consequently, was discharged as recovered. Twenty days after leaving the asylum he killed a female servant by cutting her throat with a razor, having shown no indication of insanity up to within a few hours of the act. Acquitted, at his trial, on the ground of insanity, he was sent to Bethlem Hospital as a criminal lunatic, and the medical officer, after an observation of several months, said that he could not attach any particular symptom of insanity to him, and that, supposing he was a private patient, and the Commissioners in Lunacy asked why he was detained, he could give no definite reason for it. Maudsley thinks it probable that Dr. Pownall had delusions, but was able to conceal them successfully when he had a strong motive to do so.

II. Suicidal impulse.—Amongst the general public there is a fairly wide-spread feeling that suicide should be regarded as evidence of insanity, and this feeling receives encouragement from the common verdict of the coroner's jury of 'Suicide whilst temporarily insane.' This verdict, no doubt, is frequently found to avoid the distress which a verdict of *felo-de-se* would cause the relatives of the deceased, and formerly was probably devised so that the penalties which such a verdict then carried with it might be evaded. Although, perhaps, the majority of cases of suicide are rightly attributable to insanity, yet there are many instances of self-destruction where the act has been carried out with a distinct motive, and at a time when the perpetrator has doubtless been in a sane condition.

Insane suicidal impulse may exist either with or without delusions, and the impulse may be controlled for a time. The patient may feel impelled towards a particular mode of self-

destruction, and may avoid other modes which may be more accessible and easier of carrying out. When the suicidal impulse is due to some pre-existing mental disorder, there is, generally, a definite delusion. The patient imagines that he is being persecuted or tortured in some way, and seeks to escape his misery by death; or he hears a voice or voices commanding him to kill himself.

III. **Kleptomania.**—This is a propensity or impulse to steal on the part of persons usually of excellent moral character in other respects, and whose social circumstances usually preclude the idea of want as a motive for the crime. If, however, the propensity is due to an insane state, the individual will show evidence of mental disease apart from the act of theft. It is not likely that loss of the highest control would exclusively limit its manifestations to the act of stealing. The defence of an alleged case of kleptomania should prove that the individual was incapable of appreciating the act of theft as a wrong one, otherwise the whole class of thieves might justly urge the plea of kleptomania as rendering them irresponsible for their crimes.

IV. **Pyromania.**—This is a propensity or impulse to set fire to furniture, houses, &c., without any motive. This moral perversion is generally connected with other morbid impulses.

V. **Dipsomania.**—This is an uncontrollable impulse to drink intoxicating liquids. The individual continues to drink until the attack ceases, or until he is prevented by restraint from obtaining drink. A dipsomaniac only indulges in alcoholic drinks when the impulse seizes him; a drunkard drinks whenever the opportunity occurs.

VI. **Destructive mania.**—This is a propensity or impulse to destroy.

VII. **Nymphomania.**—This is uncontrollable sexual impulse in the female.

VIII. **Satyriasis.**—This is uncontrollable sexual impulse in the male.

Diagnosis of impulsive insanity.—Careful enquiry should be

made into the past history of the individual, and also into that of his relatives. The nature of the act and the manner of its commission should be noted, and whether motive was present or absent. Suspicion of insanity naturally arises if the assailant has attacked or killed a near and loved relative, or if, on the other hand, the assailed person is a perfect stranger to him. The symptoms and history of epilepsy should be very carefully enquired into, as in epileptics a homicidal attack may take the place of the ordinary convulsion. If there be complete unconsciousness on the part of the assailant of the act of violence, epilepsy should be strongly suspected.

Medico-legal relations of suicide.—The attempted act of suicide is regarded by the law as a punishable offence, unless the individual is proved to be irresponsible for his actions on the ground of insanity. A person aiding and abetting another person to commit suicide is guilty of murder. If two persons mutually agree to commit suicide in the presence of each other, and if one dies and the other survives, then the latter, if he has aided and abetted the suicide of the other, is still guilty of murder. If an individual, attempting to commit suicide, occasions the death of another person, but recovers himself, then he is guilty of manslaughter.

GENERAL PARALYSIS OF THE INSANE

This disease consists in a gradual loss of the ability to perform co-ordinated muscular movements, accompanied by gradually increasing mental deterioration. According to Savage¹ general paralysis may develop in any of its forms without mental symptoms for a considerable length of time; but unless cut short by some intercurrent or accidental cause, mental deterioration shows itself before the end. The disease essentially consists of a gradual destruction of the higher nerve centres, followed by a general degeneration of nervous tissues; these changes are manifested by a gradual loss of the highest acquirements, accompanied by more or less loss of self-control.

¹ *Insanity and Allied Neuroses.*

General paralysis of the insane occurs most frequently in the male sex, and chiefly affects robust active-minded men of between thirty and fifty years of age. It may be brought on by sexual excess, alcoholism, a blow or other direct injury to the head, and by anxiety, especially of that form connected with *over-strain* rather than over-work. It should be borne in mind that, although sexual excess may bring on general paralysis, yet sexual excess is a common early symptom of the disease.

Prodromal symptoms.—I. *Psychical.*—Sleeplessness at night is common, and what sleep is obtained is disturbed by bad dreams; at the same time there is a tendency to sleep after meals. The character and habits of the individual gradually change, the patient becoming gloomy and sad, or gay and loquacious, or appearing partially demented; his affection for relatives and friends may change. Loss of memory for recent events and for proper names gradually comes on, and is accompanied by slow and slightly imperfect speech. The patient may become extremely egotistical, or may indulge in acts of theft or of exposure of the person. General paralysis may follow a sudden outbreak of mania.

II. *Physical.*—Neuralgic pains, localised or general, may occur. The eyes are frequently injected, and subjective auditory sensations, such as hummings, whistlings, &c., may be experienced. Constant activity, excesses in eating and drinking, and sexual excesses are fairly common early symptoms. Some degree of paralysis supervenes, and is generally first noticed as a slight loss or defect of speech, followed by hesitation, tremor of the tongue, and some slight change in the gait. Epileptiform fits not uncommonly occur, and may precede the ordinary symptoms of general paralysis by several years. Shaw¹ states that, 'if epileptic or epileptiform fits occur at irregular intervals in a middle-aged man, mental changes, such as loss of memory, occurring with each fit, and expression being permanently affected, general paralysis is almost certainly present.'

¹ *Epitome of Mental Diseases.*

Stages of general paralysis of the insane.—For convenience of description, the symptoms of the disease may be grouped into the three following stages:—(i) The first stage, which is characterised mainly by loss of mental control. (ii) The second stage, which is characterised by increasing loss of mental and muscular power. (iii) The third stage, which is characterised by an increased severity of the symptoms generally, together with loss of control of the rectum and bladder.

1. Symptoms of the first stage. I. *Psychical*.—The most common condition is that of changeableness and restlessness. Generally a brief period of mental depression is followed by one of exaltation, the patient becoming boastful and having ideas of grandeur and wealth. During this stage the patient frequently purchases large numbers of useless articles. The psychical symptoms are in the main an exaggeration of those met with during the prodromal period.

II. *Physical*.—The physical symptoms usually commence in the muscles of articulation and expression. Fibrillary tremors of the muscles of the face, lips, and tongue occur, and are especially noticeable when the lips are separated and the tongue is protruded. The commencement of speech is difficult, and the patient talks in a clumsy and tremulous manner, experiencing especial difficulty in pronouncing the labial and lingual consonants, and frequently clipping the ends of words. The handwriting is shaky, and letters are occasionally dropped. Savage states that the change is very similar both in writing and in speech. Inequality of the pupils is a common symptom. Attacks of pyrexia lasting one or several days may suddenly occur, and as suddenly disappear. Neuralgic pains and local anæsthesia often occur at the commencement of the disease. The gait of the patient changes; he walks stiffly and lifts the legs insufficiently; he tends to deviate to one side, and readily stumbles if the ground be uneven. Sexual desire is strong; but the power to gratify it may be deficient. Temporary paralytic attacks lasting from several hours to several days may occur, and are followed by increased peculiarity in the gait. Ptosis,

strabismus, and paralysis of one of the vocal cords sometimes occur. Constipation due to want of muscular tone is common.

2. Symptoms of the second stage. I. *Psychical*.—The mental aberration increases, the ideas becoming less numerous and more absurd. Vivacity is lost, and sexual desire passes away for good.

II. *Physical*.—The muscular weakness increases in a marked manner; facial expression is lost, and the tremors of the lips and tongue generally increase. The gait is more affected, and there is less restlessness; the patient requires assistance in walking and dressing. Loss of smell and taste, and visual weakness occur. The appetite is good, but the patients eat in a disgusting manner, and masticate imperfectly. Flushings of the face from vaso-motor paralysis are common. Fits may recur at irregular intervals, and in one of them the patient may die.

3. Symptoms of the third stage.—I. *Psychical*.—In this stage the mental condition subsides into that of dementia.

II. *Physical*.—Loss of control of the bladder and rectum occurs; the loss is at first occasional, but later all control is lost. The patient loses strength, swallowing is difficult, speech is thick and indistinct, and the tongue can hardly be protruded. The writing is absolutely shapeless. Cutaneous anæsthesia is occasionally so complete that the patient can be burnt without being aware of it. Blindness and deafness may be present. The bones may become so brittle, owing to trophic changes, that a rib or long bone may be readily broken by a slight injury. The skin assumes a dull tint, and may emit a repulsive odour; bedsores are apt to form owing to trophic disturbances. Hæmatomata are apt to occur from time to time in the ears; they are due to extravasation of blood from ruptured vessels, and usually result from a blow on the ear, although occasionally they are of spontaneous origin.

Duration and termination.—General paralytics very rarely commit suicide, but their condition may lead them into accidents which end fatally. The ordinary duration of the disease

is from a few months to three or four years, though cases of ten years duration have been recorded. In a limited number of cases, temporary remissions occur. Blandford¹ states that he has seen a wonderful disappearance both of bodily and mental symptoms, the improvement lasting for some time. Death may be due to a series of fits, or to an attack of pneumonia, or to exhaustion, or to some accident, such as choking or blood-poisoning.

EPILEPTIC INSANITY

This is a mental disorder caused by the epileptic condition, and frequently, though not always, accompanied by motor epilepsy. The sudden and local discharge from the cells of the cerebral cortex may cause mental as well as motor disturbances; the mental disturbances may precede or follow the motor discharge, or may even occur without any motor disturbance. This latter fact is of great importance to the medical jurist, since in such cases the mental disturbance is the only noticeable effect of the epileptic discharge.

Epilepsy generally tends to the production of weak-mindedness, the extent of which depends more upon the frequency of the fits than upon their severity. Epileptics without being actually insane are usually gloomy, irritable, and irascible; generally they pass rapidly from anger to suavity.

There are three phases of mental disease associated with epilepsy. If the mental disorder be acute and transient, *acute epileptic insanity* or *epileptic mania* results; if the mental disorder be chronic and progressive, *chronic epileptic insanity* or *epileptic dementia* results; if mental development be impeded or arrested, *epileptic imbecility* or *epileptic idiocy* results.

Acute epileptic insanity or epileptic mania.—This form generally follows epileptic seizures, but occasionally occurs in individuals with the epileptic neurosis who have never been known to have a convulsive attack. The attacks are very

¹ *Insanity and its Treatment.*

sudden in their onset, and give rise to violent and rapid acts, which frequently are of a homicidal or suicidal character. The return to sanity is usually sudden, and is accompanied by complete, or nearly complete, forgetfulness of the acts performed during the attack. The sudden nature of the attacks, and the violence of the impulsive acts, cause epileptic mania to be one of the most dangerous forms of insanity. Epileptic mania most commonly occurs after a fit, and especially after a fit or fits supervening upon a long period of freedom from them; it occurs less frequently before a fit, and least frequently in the quiescent periods between fits. An attack of epileptic mania may or may not be preceded by an aura. The attacks in the same patient generally resemble each other. It should be borne in mind that the actions of a person during an attack of epileptic mania may be determined by any dislike or animus against a particular individual conceived during the stage of irritability preceding the attack; so that an assault may be made on the individual without the patient being conscious of it.

Petit mal intellectuel is the slight and transient condition of epileptic insanity which may occur during a slight epileptic seizure without, or with scarcely perceptible, motor symptoms. All that may be observed in an attack of this description is that the person's face becomes pale for a moment or two, and then becomes flushed. The patient may or may not lose consciousness for a moment or two, and may or may not be seized with transient vertigo. While under the influence of this slight seizure, the patient may do something absurd or indecent, such as micturating or exposing the person in public, although to the bystanders he may appear perfectly rational.

Epilepsie larvée, or masked epilepsy, is an attack of epileptic insanity that occurs in the interval between ordinary epileptic seizures. The mental attack, in fact, constitutes the epileptic attack, the discharge from the cortical cells of the brain being apparently expended on the mental centres only. After such an attack there may be complete loss of recollection of acts performed during the seizure, the condition closely resembling

that of the sleep-walking state. The recognition of such a condition is important, but, as Savage¹ remarks, 'it would be a very dangerous thing generally to allow a person accused of crime to plead epileptic unconsciousness.' Thefts committed during such a condition are scarcely likely to be confined to valuable articles only, and Savage considers that considerable reservation should be used before admitting that a person accused of stealing valuable things did this as an epileptic.

Chronic epileptic insanity, or epileptic dementia.—This condition follows on repeated attacks of epilepsy, or of acute epileptic mania, occurring through many years. There is progressive mental enfeeblement, which may pass on to profound dementia. Changes of mood are apt to be very sudden, and fits of violent anger may occur without any apparent cause. The patient may have delusions that he is being injured, and in this condition he is liable to be dangerous to those near him.

Medico-legal relations of epileptic insanity.—In dealing with the question of irresponsibility for actions committed during an attack of epileptic insanity, the medical jurist must take into consideration the evidences of other epileptic conditions and the character of the mental symptoms. Careful enquiries and search should be made as to the previous occurrence of epileptic fits, which may have escaped the recognition of the patient and his friends, especially if they have occurred during the night. The signs of their occurrence would be biting of the tongue, lips, or cheek; presence of froth about the mouth on waking; unconscious micturition; or the occurrence of numerous small subcutaneous ecchymoses about the neck and forehead—a sign which is considered by Trousseau to be a very important one. The occurrence of periodical attacks of vertigo or of short lapses of consciousness should be enquired after.

¹ *Insanity and Allied Neuroses.*

PERIODICAL OR RECURRENT INSANITY

Attacks of insanity may recur more or less regularly, with lucid or sublucid intervals. Certain physiological periods, such as puberty and the climacteric, may mark the commencement of the attacks; other physiological periods, such as those of menstruation, may mark the recurrences.

When this form of mental disease is fully established, the periodical attacks in the same patient are almost exactly similar to each other. The attack frequently commences when the patient gets excited, and while it lasts he is apt to commit some act of criminal violence. In some cases, sexual perversion is the most prominent feature of an attack. During the so-called lucid or sublucid intervals, the patients, in many instances, are not quite free from some slight degree of insanity. They are morbidly irritable, or hysterical, or eccentric; as time goes on their energies become diminished, and their emotions become blunted.

INSANITY IN RELATION TO CHILD-BEARING

This includes insanity developed during pregnancy, parturition, or lactation. The term 'puerperal insanity' is used by some authors to include all these forms of insanity, whereas other authors apply it only to the mental derangement occurring at the time of delivery or shortly afterwards.

Insanity of pregnancy.—This form of insanity is not nearly so common as that following child-birth. When it occurs it is usually after the third month of gestation, and generally takes the melancholic form; exceptionally it may take the maniacal form. The patient is subject to delusions and hallucinations, and may have ideas of poison being present in her food, or takes a dislike to her husband, or entertains suspicions and general dreads. The delusions are frequently exaggerations of the fancies and anxieties that so often occur in pregnancy. In the severe forms there is a strong impulse to suicide, and there may be a homicidal tendency.

Puerperal insanity.—This is more liable to occur in women suffering from debility due to improper supply of food, or to rapid succession of pregnancies, or to the simultaneous carrying on of lactation and pregnancy; it may also be induced by the weakness resulting from hæmorrhage or exhaustion during parturition. Irritation arising in the breasts or pelvic viscera may tend to its production. It is also apt to be brought on by excessive mental excitement or depression. In the majority of the cases there is inherited neurotic tendency.

During the second or third day after delivery a transitory mania may arise suddenly and pass off as quickly (Savage). Puerperal insanity usually commences within a week or fourteen days of delivery. The attack is apt to be attended with sudden impulsive acts of violence, and the woman frequently attempts to commit suicide, or makes a homicidal attack upon her child or relatives and friends. It should be borne in mind that women suffering from puerperal insanity may commit most unexpected crimes, and that the killing of the child may be mistaken for an instance of intentional infanticide. An attack of puerperal insanity is sometimes attended with albuminuria, and with suppression of the milk and lochia.

Puerperal insanity may be mistaken for the delirium accompanying puerperal fever (septicæmia), pyæmia, and also for the excitement that may occur with an attack of meningitis. In these diseases pyrexia precedes the delirium, whereas in puerperal insanity the mental conditions first appear. In puerperal insanity the pupils are usually dilated, and there is not much headache; whereas in meningitis the pupils are usually contracted, and headache is very severe.

Insanity of lactation.—This occurs after the puerperal period, and may come on from the third to the eighth month after delivery, or even later. The characteristic condition is melancholia. The attack is generally due to anæmia and debility, combined with a predisposition to mental derangement. Occasionally suicidal and homicidal tendencies appear.

AMENORRHŒAL INSANITY

This is a mental derangement due to sudden suppression or disorders of menstruation. The pathological condition is probably a hyperæmia of the brain. Very occasionally acute delirious mania occurs in a young woman of neurotic heredity from sudden suppression of the catamenia. In about two-thirds of the cases the mental disease is melancholia, and in about one-third mania. As a rule, the mental health is recovered with the reappearance of menstruation, but very occasionally a chronic maniacal condition, passing on to dementia, results from prolonged amenorrhœa.

INSANITY CAUSED BY TOXIC SUBSTANCES

Alcoholic insanity.—This kind of insanity is met with in three forms, viz. *acute alcoholic insanity*, *chronic alcoholic insanity*, and *delirium tremens*. Alcoholic insanity should not be confounded with dipsomania (see p. 299); in the latter affection the alcoholic indulgence is a symptom, and not necessarily a cause; in the former disease the alcoholic indulgence is the cause of the insanity.

Acute alcoholic insanity.—This form of mental disease is most apt to occur in persons inheriting a tendency to mental disturbance, or in whom the brain has been affected by previous excesses, injury, or over-work. Such persons are likely to have a greater susceptibility to the toxic effects of alcohol than others, so that a quantity of alcohol which might not be excessive to one person may prove so to another who is predisposed to its toxic effects. The commonest form of acute alcoholic insanity is a violent maniacal delirium, known as *mania a potu*. The patient is noisy, has delusions that someone is trying to injure him, and is usually so violent as to require restraint. In consequence of his delusions he has a tendency to homicidal acts. He does not suffer from the peculiar visual hallucinations of delirium tremens, such as seeing rats, insects, reptiles, &c.

Occasionally the mental derangement takes the melancholic form.

Chronic alcoholic insanity.—This is one of the results of chronic alcoholism ; it is usually accompanied by sensory and motor affections, due to peripheral neuritis caused by the alcohol. Insomnia accompanied by restlessness and depression are among the early symptoms ; gradual mental and moral degradation accompany failure of nerve power, and the condition may pass on into complete dementia. Tremor of the hands, dreams, and later on hallucinations, occur ; the latter, according to their nature, may cause the patient to be maniacal, melancholic, or stuporous. Auditory hallucinations are the most common, the patient hearing voices speaking evil of him, or conspiring against him, or making vile suggestions. The perverted sensations caused by the peripheral neuritis are frequently wrongly interpreted by the patient, who may imagine that he is being tortured by means of electricity. Suspicions of poison being mixed with the food, or of being subjected to some treatment intended to destroy the sexual powers, are common. Such individuals frequently carry weapons, and are liable to be very dangerous. With advancing enfeeblement of memory and loss of judgment the patient becomes stupid and apathetic, and ceases to exercise care for his person. Spitzka states that tremor is the most important physical sign of this disease, and that it is most noticeable in the hands, tongue, and lips ; while the patient is actually under the influence of alcohol the tremor diminishes, and is most marked when he is sober.

Delirium tremens.—This affection may follow a single debauch, or may result from prolonged drinking, or may be caused by the receipt of an injury or shock to an intemperate person. The attack is marked by insomnia, excessive agitation, a terrified expression, and injected sunken eyes. Hallucinations, especially those of vision, soon occur, and the patient is tormented by seeing rats, insects, reptiles, wild beasts, &c., pursuing him, and preventing his attempts to either escape or to seize them. These visual hallucinations appear at first at night, but

afterwards may appear in the daytime as well, and are accompanied by profound terror. Auditory hallucinations, which generally take the form of abusive epithets, may also occur. There may be impulses to suicide or homicide. General or localised tremor may be present, and is especially marked in delirium tremens accompanied by pyrexia. In severe attacks the nervous exhaustion may proceed to partial paralysis of the arms and legs. A maniacal condition is the most frequent one in delirium tremens, but occasionally it may be melancholic or stuporous. The disease usually lasts two or three days, and terminates in several hours' sleep. In the chronic alcoholic an attack of delirium tremens may be determined by the occurrence of some acute disease, such as pneumonia, erysipelas, pericarditis, &c., or by the receipt of some mechanical injury.

Insanity from absinthe.—The attack is very similar to that produced by alcohol, but, in addition, according to Magnan, epileptic seizures frequently occur, and the hallucinations are very sudden in their onset, and quickly reach their acme.

Insanity from opium and morphine.—This form is very similar to the insanity of chronic alcoholism, but is attended with greater weakness of the heart's action, and more sickness. Savage states that symptoms resembling delirium tremens may be set up by opium-eating or by the injection of morphine. The constant use of morphine produces a most debasing moral effect, and the meanest artifices are resorted to by persons addicted to its use in order to obtain the drug. Tremor, loss of memory, anorexia, loss of flesh, and hallucinations occur as in connection with chronic alcoholic insanity. Recurrent visceral neuralgia, which may resemble the pain caused by the passage of a gall-stone, may be a prominent symptom.

Insanity from chloral.—This drug may produce insanity of the same type as that produced by alcohol. According to Savage, it produces loss of control and tendency to impulses, so that suicide or homicide may be committed; or the loss of self-control may lead to death by an excessive dose of the drug being taken.

Insanity from lead.—The attack is usually gradual, and is preceded by headache, depression, tremor, and sleeplessness. It may take the form of acute mania, melancholia, or dementia. Occasionally it assumes a comatose form, and saturnine convulsions, resembling those of epilepsy, but not preceded by an aura, may occur. In one case Savage observed symptoms closely resembling those of general paralysis.

Insanity from mercury.—Insanity produced by this drug is preceded by mental irritability, anxiety, terror, insomnia, and hallucinations. Mania, melancholia, or dementia may develop.

Insanity from syphilis.—This may be caused in any of the following ways:—(i) A form of hypochondriasis, according to Savage, may be started by syphilophobia; the patient has either a morbid dread of the disease itself or of subsequent disfigurement, or believes that he is a source of contagion to others coming into his vicinity. (ii) The syphilitic fever may start a condition of mania. (iii) General syphilitic arteritis may produce degeneration of the nervous system. (iv) Syphilis may cause optic neuritis, and this may give rise to delusions. (v) Congenital syphilis may be the cause of cranial defects, sensory defects, nervous defects, or moral defects.

Usually the insanity resulting from syphilis gradually progresses to dementia, but occasionally attacks of acute delirium and of delusions occur.

Insanity from diabetes.—Clouston has described two cases of melancholia from this cause. Maudsley and others have observed that diabetes sometimes occurs in the same families in which insanity is present.

IDIOCY

This term is applied to a condition of mental deficiency which is either congenital, or which occurs during the early periods of life, before the period when the mental faculties normally begin to develop. **Imbecility** is a minor degree of mental deficiency.

All grades of mental deficiency are comprised in the term idiocy, from persons whose mental condition closely resembles that of a mild form of imbecility to those whose intelligence may be lower than that of some animals, and who lead an automatic existence. The physical as well as the mental condition of idiots is affected. The stature is less than normal, the muscles are flabby, and the bones are frequently weak and deformed. The circulation is generally feeble. The palate is usually vaulted or keel-shaped; the teeth are irregular, late in appearing, deficient in number, and tend to decay early. The lips are thick, the tongue is usually enlarged, and the ears are generally ill-formed and large. Speech is defective, partly from malformations of the mouth, partly from want of co-ordination of the muscles of the tongue and lips, and partly from lack of ideas. Defects of vision, smell, and taste are common. The memory may be good, but there is deficiency of the faculties of attention and observation. Judgment and reasoning power are lacking; idiots are frequently very mischievous and cruel, and may be dangerous to those within their power.

Langdon Down¹ classifies cases of idiocy into the three following primary groups:—(i) *congenital*, (ii) *developmental*, and (iii) *accidental*.

I. *Congenital idiocy*.—This includes all those cases which show signs of defective mental power at birth, associated with conditions of the head indicative of a congenital origin. This group includes the microcephalic and macrocephalic idiots. As a rule, the average size of heads of idiots is smaller than those of healthy individuals.

II. *Developmental idiocy*.—In this form the mental deficiency is due to imperfect development at the periods of the first dentition, or of the second dentition, or at puberty; the primary cause is probably some defective nutrition of the embryo during intra-uterine life.

¹ Quain's *Dictionary of Medicine*, vol. i. 1894.

III. *Accidental idiocy*.—This group includes those cases in which the mental breakdown is due to some accident or some intercurrent malady, such as a fall, a fright, epilepsy, meningitis, or disease of the middle ear secondary to scarlet fever or measles.

Cretinism.—This is a peculiar form of idiocy, frequently associated with enlargement, but occasionally with atrophy and absence of the thyroid gland. Apparently some relationship exists between cretinism and goitre; in places where goitre has been prevalent for generations, cretinism is common. The development of the body proceeds slowly in a cretin, but the child is very stout, and presents a swollen appearance; the head is large, the face flat and broad, with a flat nose, large mouth, and thick lips; the ears are large and expanded. The abdomen is tub-like, the limbs are small and feeble, the speech is slow in development, and stammering is common. Cretinism generally appears before the fourth year, and rarely comes on after the seventh; it is more common among males than females.

CHAPTER XLI

Criminal responsibility—Acts due to impulsive insanity—Tests of irresponsibility—Tests of insanity—Criminal responsibility of drunkards.

CRIMINAL RESPONSIBILITY

THE question of the responsibility of a person who commits a criminal act is of great importance to the medical jurist and to the community. A criminal act implies the existence of intention, will, and malice; in a criminal court the term 'responsibility' means liability to legal punishment. If it can be proved that a person was insane at the time of committing what is ordinarily known as a criminal act, then he is held to be irresponsible to the law for the commission of that act—in other words, he is not considered to be punishable. For the proof of the mental condition of the accused person medical evidence is required. In such cases the evidence of the medical jurist should be most carefully weighed and considered; for although, on the one hand, it is important that persons should not be punished for acts which are directly due to pathological processes, yet, on the other hand, it is most important to avoid the adoption of the principle that irresponsibility for actions is conferred by the presence of merely slight mental irregularities.

The following so-called 'legal test' has been adopted by the administrators of the law as indicating the proof required to render a person irresponsible:—

'To establish a defence on the ground of insanity, it must be clearly proved that at the time of committing the act the party accused was labour-

ing under such a defect of reason from disease of the mind as not to know the nature and quality of the act he was doing, or, if he did know it, that he did not know he was doing what was wrong.'

As Bucknill observes, 'The element of disease, therefore, in abnormal conditions of mind is the touchstone of irresponsibility, and the detection of its existence or non-existence is the peculiar, and oftentimes the difficult, task of the psychopathist.' The difficulty lies in deciding what degree of mental disease shall carry with it legal irresponsibility, a difficulty which is increased by lawyers sometimes demanding that a sharp boundary shall be fixed between sanity and insanity. It was suggested by Weatherly at the annual meeting of the British Medical Association in 1894 that when the subject of criminal responsibility arises, the following questions should be placed before the jury, and upon them the medical witness should be examined:—(i) Was the accused at the time of the commission of the act with which he is charged, and before that time, labouring under such mental disease as to render him certifiably insane? (ii) If insane, how far was the crime the outcome of his insanity?

At one time it was held that a man was responsible unless he was totally deprived of his understanding and memory, and no more knew what he was doing than an infant or a wild beast (Justice Tracey's dictum in 1723).

In 1812, in the case of Bellingham, who was executed for shooting Mr. Spencer Perceval, Lord Chief Justice Mansfield laid it down that if a person labouring under mental derangement were capable in other respects of *distinguishing right from wrong*, he could not be excused for any act of atrocity which he might commit; if the act were murder, it must be proved that at the time he committed the act he did not consider that murder was a crime against the laws of God and nature. This dictum is not in harmony with our present views as to mental derangement and consequent irresponsibility for acts committed while in such a state. That a perfect knowledge of the nature of the act at the time of its commission is

no evidence of sanity can be demonstrated in any lunatic asylum.

In 1843 the trial of MacNaughton for the murder of Mr. Drummond led to the prisoner's acquittal on the direction of Chief Justice Tindal that the point for the jury to consider was, whether the accused had at the time the act was committed *that competent use of his understanding as that he knew that he was doing by the very act itself a wicked and wrong thing*. This view of the subject changed the doctrine of the knowledge of abstract right and wrong to a knowledge of right and wrong in relation to a particular act at the time of committing it. The matter was considered so important at the time that the House of Lords laid a series of questions before the fifteen judges with the object of endeavouring to settle the state of the law. The statements of these judges remain the principal exposition of the English law when insanity is pleaded in excuse for crime. The following brief *résumé* of the answers to the questions is compiled by Sibbald¹:—‘To entitle an accused party to acquittal on the ground of insanity, it is necessary that he be either of diseased mind, and at the time he committed the act not conscious of right or wrong; or, that he be under some delusion which made him regard the act as right.’

In courts of law proof of a delusion or of delusions has frequently been required as evidence of insanity. It would, however, be most unjust to necessarily hold a person responsible for an act because he had no delusion as a foundation for the act. It is not essential that a person should have a delusion to annul responsibility.

Acts due to impulsive insanity.—If such acts occur in persons who have suffered from unsoundness of mind, it is then easy to arrive at a correct conclusion as to their irresponsibility; the difficulty arises when the impulsive act is the only evidence of insanity. Undoubtedly insane impulses occur which cause an individual to lose self-control, and so to commit an act of which he afterwards remembers all the details.

¹ Quain's *Dictionary of Medicine*, vol. i. 1894.

An impulse to commit homicide may so dominate a person that he may carry it into effect, although he is aware that he is doing wrong, and, therefore, is liable to punishment. This is illustrated by the case of a man named Ware who was indicted for murder at the Shropshire Winter Assizes in 1885. The prisoner had been a patient in an asylum, and while there had killed another patient with an iron bar; he was aware of the nature of the act at the time he committed it, for he acknowledged that he had killed someone, and asked the attendant to promise that he should not be punished if he gave up the iron bar. He was sent to the criminal lunatic asylum at Broadmoor. In connection with the case Mr. Justice Hawkins made the following remarks, which bear upon the subject under consideration:—‘It would be impossible to say that Ware did not know that he had killed a man, because he said himself that he had, and it would be impossible for anybody to urge that he did not know it was wrong, for he wanted a promise that he should not be punished; but unless one put a totally different construction on the law, *that* would have to be proved, although no man in his senses would suppose that any jury would find Ware responsible for what he had done.’ It is evident, therefore, that a person suffering from unsoundness of mind may by an insane impulse so lose his self-control as to commit an act which he knows at the time is wrong, and is punishable by law, but which he cannot prevent himself from doing. Mr. Justice Kay, when directing the jury in the case of Gill, tried at the Leeds Spring Assizes, 1883, said:—‘The most important question was, were they dealing with a sane man? Judges had said over and over again that a man could not be considered insane merely because he did a criminal act, and the importance of that view could not be over-estimated. Nevertheless, he did not agree with the learned counsel, who put it that “it was necessary to prove that a man did not know the difference between right and wrong in order to show that he was insane.” . . . What the jury had to ask themselves was—Was the prisoner’s mind subject to an uncontrollable impulse over

which his will had no power? If so, they must acquit him on the ground of insanity.'

True test of irresponsibility.—The majority of writers on forensic medicine agree that the real criterion of responsibility is the freedom of the will, and that the true test of irresponsibility is whether the individual has lost the power to control his actions. Ordronaux states that an individual is criminally responsible for an act if, in addition to knowing the nature and consequences of the act, and having a felonious intent in its commission, *he had the power to choose between doing and not doing it*. Ray says that 'liberty of will and action is absolutely essential to criminal responsibility, unless the constraint upon either is the natural and well-known result of immoral or illegal conduct.' Pagan observes that the 'loss of control over our actions, which insanity implies, is that which renders the acts which are committed during its continuance undeserving of punishment.' Mittermaier describes free volition as being made up of freedom of judgment and freedom of choice. Maudsley considers that the determination of responsibility in cases where insanity is alleged depends on whether a connection can or cannot be traced between existing disease and the act. When irresponsibility for an action on the ground of insanity is pleaded, the law requires the following questions to be answered¹— 'Was the person, whose act is in question, able to understand its nature, and to pass a fairly rational judgment of its consequences to himself and others, and was he a free agent so far as that act was concerned?' A lunatic may be able to distinguish between right and wrong, but not be able to *choose* between them. As Orange observes, 'A criminal is punishable, not merely because he has the power of distinguishing right from wrong, but because he voluntarily does the wrong, having the power to choose the right.' If, therefore, an action is traceable to, or its nature is determined by, mental disease affecting the individual, the irresponsibility of that person for the act in question must be admitted, as,

¹ *Jour. Ment. Sci.*, 1891.

obviously, he cannot be punished for an act which was the result of disease.

As a rule, too much stress is laid on the plea of real or assumed heredity. This question is strongly commented on by Bucknill¹ when discussing the plea of insanity in the case of Guiteau, the assassin of President Garfield: 'The argument in favour of insanity founded upon the supposed transmission of an hereditary tendency to mental disease has of late been used in most absurd and unjustifiable excess, and I do not know that the interests of justice would be damaged if it were to be excluded altogether in judicial enquiries; for if it could be clearly shown that both a man's parents, and all four of his grand-parents, and all his uncles and aunts, had been unquestionably insane, it would afford no proof whatever that the man himself had been insane. Such evidence would, at the most, strengthen the presumption that he had been so under circumstances which would otherwise be more doubtful.'

Forms of insanity in which crimes are committed.—Mania, epileptic insanity, melancholia, impulsive insanity, moral insanity, periodical insanity, puerperal insanity, alcoholic insanity, delusional insanity, imbecility and idiocy, dementia, and early general paralysis.

Infanticide may be connected with insanity associated with the birth of a child, or with a transient mania associated with the secretion of milk, or with insanity due to exhaustion from over-lactation or excessive child-bearing. In any of these conditions a loving mother may murder her whole family; in such a case the law rightly considers the crime itself to furnish sufficient evidence of the insanity.

Medical tests and indications of insanity.—When a medical man is required to give an opinion as to the sanity or otherwise of a prisoner, it is occasionally necessary to have the person under observation for some time. Attention should be especially directed to the following points:—

I. The assigned cause; whether there was an apparent

¹ *Brain*, 1883.

causelessness for the crime or an utter disproportion between the crime and the supposed end to be attained. Enquiry should be made as to the relationship between the crime and any delusions. The acts of the prisoner immediately preceding and following the deed should be ascertained.

II. The history of any insane or nervous inheritance should be gone into.

III. If a number of murders have been committed at once, such as when an affectionate mother or father butchers an entire family, the acts are strongly indicative of insanity.

IV. If a murderer make no attempt to escape, but delivers himself up and confesses to the crime, the presumption is in favour of insanity. Such action is especially likely to follow a murder committed during an attack of impulsive insanity.

Criminal responsibility of drunkards.—No definite rules are laid down by the law to apply to cases when drunkenness is pleaded as an excuse for crime, or in mitigation of the punishment. An offence or crime is not excused if committed by a person who has lost his self-control from drunkenness voluntarily induced on his part. The loss of control is due to self-indulgence on the part of the individual, and although in such a condition he may not be, strictly speaking, responsible for his actions, yet he is responsible for his condition of irresponsibility. If, however, it can be shown that drunkenness had produced a mental disease, and that the crime was committed while suffering from such disease of the mind, then the irresponsibility of the individual must be admitted. Savage,¹ in discussing the complicated relationships between responsibility and irresponsibility of persons in a condition of alcoholic intoxication, says :—‘ A person, say, is given powerful stimulants, masked or concealed in some way, or being weak, or suffering from an old injury to the head, an amount which formerly would not have affected him now produces a great effect ; in a state of acute alcoholism he commits a crime, and doubtless would be considered not guilty ; but if he has experienced several times the danger which

¹ *Insanity and Allied Neuroses.*

he incurs by taking stimulants even in small quantities, and yet continues to indulge, and then perpetrates a crime, he may justly be considered responsible, even although it may be proved that by inheritance, or in consequence of injury to the head, he is especially liable to be affected by stimulants. Next, if, in consequence of intemperance, he becomes slowly affected by mental disorder, and in a state of delirium tremens he commits a crime, he will probably not be considered fully responsible. If, instead of delirium tremens, alcohol produces chronic insanity or general paralysis of the insane, and in this condition of genuine insanity he does harm, he will not be considered responsible for his acts.'

The rulings of different judges with regard to the criminal responsibility of drunkards show some remarkable discrepancies. In the case of *Reg. v Williams* (C.C.C., 1886), Denman J. ruled 'that a crime committed during drunkenness was as much a crime as if it were committed during sobriety, and that the jury had nothing to do with the fact that the man was drunk. The prisoner was supposed to know the effect of drink, and if he took away his senses by means of drink, it was no excuse at all.' In *Reg. v. Burns* (Liverpool Ass., 1865), Bramwell B. ruled 'that drunkenness was no excuse, and that a prisoner cannot by drinking qualify himself for the perpetration of crime; but if through drink his mind had become substantially impaired, a ground of acquittal would then fairly arise.'

These rulings are in marked contrast to the following. In *Reg. v. Short* (Glasgow High Court, 1889), the prisoner, a woman, was charged with the murder of her child by neglect and starvation. It was proved that between July 6th and 11th the prisoner neglected to provide the child with necessary food, and that it died on the 11th from starvation and neglect; it was also proved that on July 6th the prisoner was suffering from alcoholism, and on July 8th from delirium tremens. After hearing the counsel for the Crown, and without calling on the counsel for the accused, Lord Young ruled 'that no evidence had been

adduced which would legally justify a verdict of culpable homicide. . . . He denied that it was murder, culpable homicide, or any crime punishable by law in that court, for either a woman or a man to drink too much whisky, or get an attack of delirium tremens, which was insanity. . . . In this case there was no intention to injure, and he must rule that there was no proof of any crime.' The jury, therefore, returned a formal verdict of 'Not guilty.' In *Reg. v. Baines* (Lanc. Ass., 1886), Day J. ruled 'that whatever the cause of the unconsciousness, a person not knowing the nature and quality of his acts is not responsible for them; and that if a man were in such a state of intoxication that he did not know the nature of his act, or that his act was wrongful, his act would be excusable.' In *Reg. v. Mary R.*, 1887, Chief Baron Palles ruled 'that, if any one, from long watching, want of sleep, or deprivation of blood, was reduced to such a condition that a smaller quantity of stimulant would make him drunk than would do so if he were in health, then neither law nor common sense could hold him responsible for his acts.'

CHAPTER XLII

Methods of placing lunatics under restraint—Reception orders on petition—Urgency orders—Inquisition—Summary reception orders—Orders by commissioners—Medical certificates—Testamentary capacity—Feigned insanity—Restraint of habitual drunkards.

LUNACY CERTIFICATES

BEFORE a lunatic can be placed under restraint, certain conditions specified by law have to be carefully observed. The consolidating and amending Lunacy Acts of 1890 and 1891 define the duties, rights, and liabilities of those who have the certifying and the charge of lunatics, and as these Acts have considerably modified and changed the mode of procedure previously in force, it is essential that medical practitioners should have a thorough knowledge of their provisions.

The term 'judicial authority,' frequently mentioned in the Acts, refers to judges, magistrates, and justices of the peace. The objects of the Acts are to place well-defined restrictions upon all persons wishing to place a lunatic under restraint; to provide for the summary restraint of persons whose condition is such that an extreme course of action is necessary for their own welfare or that of the community; and to ensure the proper treatment and care of lunatics while under restraint. As a general rule, a careful investigation is conducted by unprejudiced public officials before the commitment of the lunatic takes place. To this rule urgency orders, summary reception orders, and procedure under which pauper lunatics and persons improperly cared for may be detained, are exceptions.

Different methods of placing lunatics under restraint.—The following six methods, which are adapted to the requirements of different cases, are those by which a lunatic can be placed under control :—

1. Under a reception order obtained by petition.
2. Under an urgency order.
3. Under an order after inquisition.
4. Under a summary reception order.
5. Under a reception order by commissioners.
6. Under an order where the lunatic is a pauper or is wandering at large.

The Acts contain definite rules which have to be carried out by the managers of institutions in which lunatics are confined. Fresh arrivals have to be notified; the reception orders have to be shown at certain times, and such orders, at proper intervals require renewing or continuing, or else they expire and become useless; persons interested in asylums or institutions must have nothing whatever to do with orders or certificates introducing patients to them. To see to the proper carrying out of these regulations the legislature employs a number of persons, of high and undoubted integrity, to make constant and unexpected visits to every house in which lunatics are detained.

I. Reception orders on petition.—This is the usual course adopted in the case of private patients. A petition for an order may be presented to a judge of the county court of the district in which the lunatic is, or to the magistrate, or to a justice of the peace especially appointed to exercise the powers of the Act, whether in his district or not. By the Act of 1891 the Lord Chancellor may empower the chairman of a Board of Guardians to sign reception orders of pauper lunatics, such orders having the same effect as orders signed by a justice under the Act of 1890. The petition, which should if possible be presented by the husband or wife or a relative of the private patient, must state that he or she last saw the lunatic within fourteen days of the presentation of the

petition, and must also state in what way the petitioner is connected with the supposed lunatic, and if not related, why a relative does not present it, and the circumstances under which the petition is presented. The petitioner also undertakes to visit the supposed lunatic personally or by deputy at least once in every six months; and the petition is accompanied by a statement of particulars, and by two medical certificates (see p. 332) on separate sheets of paper.

In the statement of particulars, the name, sex, age, condition, and other details concerning the supposed lunatic are given; and, in the medical certificates, the medical men signing state when and where they examined personally and separately the supposed lunatic, and the grounds upon which their conclusions were formed, keeping apart the facts indicating insanity observed by themselves from the facts communicated to them by others. On presentation of this petition, statement of particulars, and the two medical certificates, the judge, or magistrate, or justice, if satisfied with the evidence, may sign and issue the order, without seeing the patient, authorising the medical superintendent of the asylum or hospital, or the licensee of the house in which the lunatic is to be placed, to receive him as a patient. The consideration of the petition takes place in private. The judge, magistrate, or justice may, if he think proper, appoint a time not more than seven days after the presentation of the petition for enquiries and consideration; he may also visit the supposed lunatic. If the lunatic has not been personally seen by the judicial authority, he has the right to be taken before or visited by some other judicial authority, unless the medical officer states that such would be prejudicial to his condition. It is the duty of the manager of the institution, within twenty-four hours of a lunatic's reception, to give him notice in writing of his right to be so examined, and arrange if necessary for a personal examination to take place. The second judicial authority may, if he please, see the certificates and other documents on which the reception order was originally made, and, after seeing the patient, will report

to the commissioners. A manager of an asylum, or any person having charge of a single lunatic, who omits to perform this duty is guilty of a misdemeanour.

In order that a person receiving a lunatic may be able to ascertain whether the justice signing the reception order has been duly constituted a judicial authority, lists of the justices so appointed are published by the clerk of the peace of each county or borough. A reception order ceases to be valid after the expiration of seven clear days from its date, except when suspended by a medical certificate of unfitness of the lunatic for removal, in which case the lunatic may be received within three days after the date of a medical certificate to the effect that he is fit to be removed.

II. Urgency orders.—These orders are for cases in which it is expedient that a supposed lunatic, for his own interests or for those of public safety, should be quickly placed under care and treatment; provided he be not a pauper, as in that event other rules apply. An urgency order is peculiar in that the alleged lunatic can be temporarily placed under restraint without the intervention of a judicial authority. An urgency order (see p. 333) should, if possible, be made by the husband or wife, or by a relative of the supposed lunatic, and need be accompanied by only one medical certificate and the statement of particulars. The medical certificate must contain a statement that it is expedient for the alleged lunatic to be forthwith placed under care, with the reasons for such statement.

The person making an urgency order practically takes the law into his own hands for the time; he declares that he is twenty-one years of age, that he last saw the alleged lunatic within two days, and he authorises the superintendent of the asylum, or the licensee of the house in question, to receive and detain the patient. An urgency order remains in force for seven days from its date, and if the supposed lunatic is to be further detained, a proper reception order must be petitioned for and granted, or his release, except while the reception order is still actually pending, must follow.

The peculiar features of an urgency order are—(i) that no intervention of a judicial authority is required, (ii) that the person making the order, as well as the medical man signing the certificate, must have seen the supposed lunatic within two days, and (iii) that one medical certificate only is required.

III. Orders after inquisition.—An inquisition takes place by order of the judge in Lunacy. It is an enquiry as to whether a person is of unsound mind, and incapable of managing himself and his affairs. The supposed lunatic, unless beyond the jurisdiction, receives notice, and is entitled to demand that the enquiry shall take place before a jury; this is granted, unless the judge is satisfied by personal examination that the person is not mentally competent to form or express such a wish. If the supposed lunatic is found to be incapable of looking after himself, he is entrusted to a committee, and such committee may grant an order for his detention in any asylum, hospital, or licensed house. In cases where no committee has been appointed, a Master in Lunacy may sign the order. The individual may be found incapable of managing his or her property on account of deficiency of intellect, but may not necessarily be a fit and proper person to be placed under restraint; in such a case his or her affairs are placed in the hands of a committee, but the individual is not deprived of freedom of action in other respects; he can remain at home and go about as he pleases. Lunatics who are taken charge of after inquisition, whether under restraint or not, are called 'chancery lunatics,' because they are under the care of the Lord Chancellor, who is at the head of the administrative department concerned with the lunacy laws.

IV. Summary reception orders, and orders for lunatics wandering at large.—A constable, relieving officer, or overseer of a parish having knowledge that a person, *not a pauper*, and not wandering at large, is deemed to be a lunatic, and not under proper control, or cruelly treated or neglected, is compelled within three days to give information on oath to a justice authorised under the Act. The justice thereupon, or upon the

voluntary information of any person, whomsoever, sends two medical practitioners to visit and examine the supposed lunatic ; after which he has the same power to grant a reception order as if a petition had been presented, and to commit him to an institution, to which, if a pauper, he might be sent under the Act. If it be expedient for the welfare of the lunatic or for the public safety, the justice may order the lunatic to be removed to the workhouse of the Union, if it contain sufficient accommodation ; his detention, however, in a workhouse must not exceed fourteen days.

A medical officer, knowing that a pauper resident within his district is a lunatic, and a proper person to be sent to an asylum, must within three days give notice in writing to the relieving officer of the district, or to an overseer of the parish where the pauper lives. Such officer or overseer then gives notice to a justice, who orders the lunatic to be brought before him, or before some other justice, within three days. Similarly, if a constable, relieving officer, or overseer knows that any person, *whether pauper or not*, is wandering at large within the district or parish, and is deemed to be a lunatic, he must immediately take the person before a justice ; or, if a justice receive sworn information that any such person is wandering at large, he can order that person to be brought before him, or, if he think fit, may examine the supposed lunatic at the residence of the latter. The justice can then call in a medical practitioner, and if the latter certifies to the lunacy, and the justice himself is satisfied as to it, and also as to the propriety of detaining the lunatic, he may grant an order for reception into an institution. In the case, therefore, of **pauper lunatics**, or of **lunatics wandering at large**, only *one* medical certificate is required.

In urgent cases, a constable, relieving officer, or overseer, has summary power in relation to lunatics who are paupers, or are cruelly treated by the persons having charge of them, or are wandering at large. If he consider that it is necessary for the public safety, or for the welfare of the alleged lunatic, that he should be placed under control at once, he may remove the

person to the workhouse of the union in which he is, where he may be detained for any period not exceeding three days, during which the official so removing him must take proceedings to obtain a summary reception order in the usual manner. It will be seen that this temporary proceeding does not require the intervention of a judicial authority.

V. Reception orders by Commissioners.—Two or more Commissioners may grant a reception order for a pauper lunatic, if a medical practitioner sign a certificate of his lunacy, and provided they are satisfied that the pauper is a lunatic and a fit person for restraint.

A lunatic is not allowed to remain in a workhouse unless the medical officer certifies to his lunacy, and also that he is fit to remain there, and that the accommodation is sufficient, or that it is not necessary to keep him separate from the other inmates. After the detention of a lunatic, so certified, for fourteen days in the workhouse, an order signed by a justice having jurisdiction in the district where the workhouse is situated becomes necessary. To this order the medical certificate upon which it is founded must be attached. When a pauper lunatic is discharged from an institution for lunatics, he may, if the medical officer of such institution certifies that he has not recovered, and is a proper person to be kept in a workhouse as a lunatic, be detained in a workhouse without further order, if the medical officer of the workhouse certifies that the accommodation is sufficient.

Continuation of reception orders.—Reception orders, unless continued, expire at the end of one year, or may, by an order of the Commissioners, expire on any quarterly day. To obtain a continuance of a reception order, a special report of the medical officer is required, accompanied by a certificate that the patient is still of unsound mind and a proper person to be detained. This report must be sent to the Commissioners not more than one month, and not less than seven days, before the period at which the reception order expires. The special report of the medical officer must give all the

information the Commissioners may require, and the latter may, if dissatisfied, discharge the supposed lunatic, or give whatever directions respecting him that they may think proper.

If the order be renewed, it will continue for a period of two years; and if again renewed, for a period of three years; and after that, for successive periods of five years, if renewed at the end of each. Managers of institutions for lunatics, and persons having charge of single patients, who detain them with the knowledge that the orders for their reception have expired, are guilty of a misdemeanour, and liable accordingly.

In the case of a person found insane by inquisition and entrusted to a committee, the medical attendant must, at stated periods, report to the Masters in Lunacy as to the patient's mental and bodily condition, certifying, if it be so, that the latter is still of unsound mind and a proper person to be detained. A Master can extend the time during which the medical report and certificate should be sent in, provided that such extension does not exceed six months.

One month after the reception of a lunatic as a private patient, the medical officer of the institution, or the medical attendant of a single patient, must report to the Commissioners as to his mental and bodily condition.

Medical certificates in lunacy.—A perusal of the copy of the medical certificate (p. 332) to be filled up in a lunacy case will give a fair idea of the duties of a medical practitioner in connection with the certification of mental disease. The facts indicating insanity and those communicated to the medical man by others must be separately stated in the certificate.

Of the two medical certificates that accompany a petition for a reception order, one should be given by the usual medical attendant of the alleged lunatic. If this cannot be done, the petitioner must append in writing to the petition the reason why it is not practicable. The certificates must not be signed by medical men interested in the institution or house to which

CERTIFICATE OF MEDICAL PRACTITIONER

(a) Insert residence of patient.

(b) County, City, or Borough, as the case may be.

(c) Insert profession or occupation if any.

(d) Insert the place of examination, giving the name of the street, with number or name of house, or should there be no number, the christian and surname of occupier.

(e) County, City, or Borough, as the case may be.

(f) Omit this where only one certificate is required.

(g) A lunatic, an idiot, or a person of unsound mind.

(h) If the same or other facts were observed previous to the time of the examination, the certifier is at liberty to subjoin them in a separate paragraph.

(i) The names and christian names (if known) of informants to be given, with their addresses and descriptions.

* Or, not to be.

(k) Strike out this clause in case of a patient whose removal is not proposed.

(l) Insert full postal address.

In the matter of of (a) in the (b) of (c) an alleged lunatic.

I, the undersigned do hereby certify as follows :

1. I am a person registered under the Medical Act, 1858, and I am in the actual practice of the medical profession.

2. On the day of 189 at (d) in the (e) of (separately from any other practitioner) (f) I personally examined the said and came to the conclusion that he is (g) and a proper person to be taken charge of and detained under care and treatment.

3. I formed this conclusion on the following grounds, viz. :—

(a.) Facts indicating Insanity observed by myself at the time of examination (h), viz.

(b.) Facts communicated by others (i), viz.

If an Urgency Certificate is required it must be added here (See Form 9).

4. The said appeared to me to be* in a fit condition of bodily health to be removed to an asylum, hospital, or licensed house (k).

5. I give this certificate having first read the section of the Act of Parliament printed below.

(Signed)

of (l)

Dated this day of 189

LUNACY 8.

Extract from section 317 of the Lunacy Act, 1890.

(53 Vict. c. 5, ss. 4, 11, 16, 28, 29.)

Any person who makes a wilful misstatement of any material fact in any medical or other certificate, or in any statement or report of bodily or mental condition under this Act, shall be guilty of a misdemeanour.

FORM OF URGENCY ORDER FOR THE RECEPTION OF A PRIVATE PATIENT

(a) Or hospital,
asylum, or as a
single patient.

I, the undersigned, being a person twenty-one years of
age, hereby authorise you to receive as a Patient into your

(b) Name of
patient.

house (a)

(c) Lunatic, or
an idiot, or a
person of unsound
mind.

(b)

as a (c)

whom I last saw at

(d) Some day
within two days
before the date
of the order.

on the (d) day of 189 .

(e) Husband,
wife, father,
father-in-law,
mother, mother-in-
law, son, son-in-
law, daughter,
daughter-in-law,
brother,
brother-in-law,
sister, sister-in-
law, partner,
or assistant.

I am not related to or connected with the Person
signing the Certificate which accompanies this Order in
any of the ways mentioned in the margin (e), Subjoined
[or annexed] hereto is a Statement of Particulars relating
to the said

*[If not the
husband or wife
or a relative of
the patient, the
person signing
to state as briefly
as possible :—1.
Why the order
is not signed by
the husband or
wife, or a rela-
tive of the
patient. 2. His
or her connec-
tion with the
patient, and the
circumstances
under which he
or she signs.]

(Signed)

Name and Christian }
Name at length }

Rank, Profession, or }
Occupation (if any) }

Full Postal Address

*How related to or
connected with the }
Patient . . . }

(f) Superinten-
dent of—the
—asylum,—
hospital, or resi-
dent licensee of
the—house
[describing the
asylum, hospital,
or house by
situation and
name].

Dated this day of 189 .

To (f)

53 Vict. c. 5.—Form 9

STATEMENT ACCOMPANYING URGENCY ORDER

I certify that it is expedient for the welfare of the said
 [or for the public safety, as the case may be] that
 the said should be forthwith placed under care
 and treatment.

My reasons for this conclusion are as follows :

.....

the lunatic is going, nor by any near relations of such persons, nor by two medical men related to or in partnership with each other, or standing in the relation of principal and assistant.

A medical man who signs a certificate upon which a reception order is made may not be the regular professional attendant of the patient while he is detained under the order. If the medical attendant of a lunatic should desire to continue his attendance during the detention of the lunatic in a single-patient house, it is essential that he should not sign either of the certificates, and that he should not derive, nor have a partner, father, son, or brother who derives, any profit from the charge of the patient. Any two Commissioners may prohibit him from visiting the patient any more, and may appoint another doctor in his place. The Commissioners may also direct how often a single patient is to be visited by a medical man; until such direction is given, the patient must be visited once, at least, every fortnight.

Persons who consider themselves to have been unjustly confined are provided by the Act with something more than would have been their means of redress at common law. They can require copies of the reception order and certificates by virtue of which they were confined, and these must be given without fee.

Examination of alleged lunatics.—The examination is undertaken with the object of ascertaining whether the person is

insane or not, and, if insane, whether he be a proper person to be put under restraint. When a medical man visits an alleged lunatic, the speech and actions of the latter may at once indicate insanity. If they do not do so, the patient should be encouraged to converse on personal matters, as the medical examiner is then most likely to obtain an opportunity of forming a judgment as to the mental state of the patient. If delusions are present, they must be carefully mentioned in the certificate, accompanied by, if necessary, an explanatory note. For instance, if a wealthy individual has a delusion that he is poor and starving, not only the delusion, but the social and pecuniary position of the patient as well, must be stated in the certificate. The officials to whom the certificates are sent know nothing of the alleged lunatic, and, without information as to his social and pecuniary position, would be unable to judge whether the idea of poverty and starvation be a delusion or not. Sometimes more than one visit is necessary before a positive decision as to the mental condition of the person can be arrived at.

The legal responsibility of medical practitioners in relation to certificates of lunacy.—A medical practitioner is not bound to certify, but if he does so he is responsible for the proper carrying out of the requirements of the law with regard to the certifying of lunatics. If a medical man make a wilful misstatement of any material fact in a medical certificate, he is guilty of a misdemeanour, and is liable accordingly.

Medical men were very liable to be harassed with legal proceedings, after signing certificates of lunacy, up to the time of the Lunacy Act of 1889, although they had acted in perfect good faith. The Lunacy Act of 1890 has two clauses which confer upon medical practitioners, among others, a certain amount of protection against vexatious proceedings. One clause enacts that such proceedings may, 'upon summary application to the High Court, or a judge thereof, be stayed upon such terms as to costs and otherwise as the Court or judge may think fit, if the Court or judge is satisfied that there

is no reasonable ground for alleging want of good faith and reasonable care.' The other clause enacts that 'an action brought by any person, who has been detained as a lunatic, against any person for anything done under this Act, shall be commenced within twelve months next after the release of the party bringing the action, and shall be laid or brought in the county or borough where the cause of action arose, and not elsewhere. If the action is brought in any other county or borough, or is not commenced within the time limited for bringing the same, judgment shall be given for the defendant.'

TESTAMENTARY CAPACITY

To render a will valid, the law requires what is known as 'a disposing mind' on the part of the testator. The interpretation of this term frequently depends upon the nature of the will itself rather than on the mental condition of the testator at the time of making the will. As regards testamentary capacity, the law requires a less amount of mental capacity for making a will than for managing property, or enjoying personal liberty. If a will distinctly represent the wishes expressed by the individual during life it would be upheld, although the person could be proved to have been insane. Patients in asylums have made wills that have been good at law. A patient suffering from a delusion is not necessarily incapacitated thereby from making a will. If the provisions of the will are just and reasonable, and the delusion does not affect those provisions, the will is usually upheld. If, however, the delusion bear on the provisions of the will, then the document might become invalidated. In the case of *Banks v. Goodfellow* (Queen's Bench, 1870), in which an attempt was made to upset the will of the testator, who had been subject to delusions and had been in an asylum, Lord Chief Justice Cockburn, in delivering judgment, said: 'that the existence of a delusion compatible with the retention of the powers and faculties of the mind will not be sufficient to overthrow the will, unless it were such as was calculated to influence the testator in making it.'

A person may be incapacitated from making a will by unsoundness or feebleness of mind, or by disease. The lethargic stage which frequently precedes death may be such as to interfere with a full comprehension of the provisions of a will made during that period. If a medical man be required to determine whether such a dying person be fitted to make a will, it is, as a rule, only necessary to ascertain whether the sick person can rationally and clearly answer a few questions put to him, and can repeat the provisions of the will he wishes to make. If, however, a medical opinion be wanted as to the testamentary capacity of a feeble-minded person who is not in a moribund state, then the medical man should insist upon a private interview with such person. In addition to the ordinary questions which are put to test the mental capacity of the individual, others should be put to ascertain whether any undue influence is being exerted over him from without. It may happen that the patient will disclose the existence of such an improper influence which, in the presence of the person who had acquired that influence, he might not dare to make.

Aphasia may interfere with testamentary capacity. In pure motor aphasia, however, the patient may be quite competent to make his wishes known, as by gesture he can show his assent to, or dissent from, any proposition. In sensory aphasia there may be no means of ascertaining the desires of the patient, the channels of communication to the mind being blocked; in cases of complete sensory aphasia the individual is not competent to make a will; but in partial cases, where either the visual or auditory channel of communication remains intact, the desires of the person might find expression.

FEIGNED INSANITY

The question of simulated or feigned insanity is one that occasionally causes much trouble and anxiety to the medical jurist. Insanity may be feigned in order to escape the punish-

ment of crime or the obligation of duty. When feigning is suspected, the first thing is to ascertain whether there be a *motive* for pretending to be insane. The second point is to enquire whether the criminal act was motiveless or not.

The motiveless character of a criminal act is very suggestive of unsoundness of mind on the part of the author, whereas if a true motive for the act can be discovered, and if that motive coincide with the general character and disposition of the individual, the presumption is that the person was responsible at the time of the commission of the crime. If the culprit has taken measures to avoid arrest, such as adopting disguise, or making preparations for flight, the presumption is that he recognised the responsibility of the deed. As a rule, an insane person evinces total apathy as to the consequences of his act. In a true case of insanity the individual will not admit that he is insane; a simulator endeavours to the utmost to impress those around him that he is mad. He will carry this so far, that if an individual casually remark, in his hearing, that the performance of some extraordinary act would be strongly indicative of insanity, he will probably perform such an act.

In making the examination of a suspected case of feigned insanity, it is important that the examiner should be well acquainted with the appearance and conduct of undoubtedly insane persons; as a rule, an impostor overacts his part. Moreover an impostor is unable to keep up motor excitement and loquacity for hours and days together without fatigue; he is unable to do without sleep, whereas a maniac will frequently pass consecutive days and nights without it. A dose of opium or a hypodermic injection of morphine will act much more powerfully on the impostor than on the real lunatic. A simulator will alter his demeanour and conduct when he thinks he is unobserved; and will frequently pretend to have suffered a total loss of memory, though such a state occurs in but few forms of insanity.

The forms of insanity most commonly feigned are mania, delusional insanity, dementia, melancholia, and imbecility. As

previously mentioned, the motor excitement and loquacity of true mania cannot be sustained by the impostor. Dementia may be fairly easily feigned, but it is a rare primary disease, and the history would probably point to the imposture. In feigning delusional insanity, an impostor generally invents new delusions every day, in place of the fixity of the delusions of the actually insane.

RESTRAINT OF HABITUAL DRUNKARDS

The Habitual Drunkards Act of 1879 (42 & 43 Vict., ch. 19) defines the term 'habitual drunkard' as meaning 'a person who, not being amenable to any jurisdiction in lunacy, is notwithstanding, by reason of habitual intemperate drinking of intoxicating liquor, at times dangerous to himself or herself or to others, or incapable of managing himself or herself, and his or her affairs.' The Act was therefore passed to facilitate the control and care of habitual drunkards. The duration of the Act of 1879 was limited to a period of ten years after its coming in force, but in 1888 the 'Inebriates Act' (51 & 52 Vict., ch. 19) was passed in order to extend the Act of 1879 for another period of ten years.

These acts license 'retreats' for the reception, control, care, and curative treatment of habitual drunkards. A duly qualified medical man is employed as medical attendant of each retreat. Any habitual drunkard desirous of being admitted into a retreat may make application on a special form to the licensee of the retreat for admission, stating the time during which he undertakes to remain in the retreat. Such application has to be accompanied by the statutory declaration of two persons to the effect that the applicant is an habitual drunkard within the meaning of the Act. The signature of the applicant to the application has to be attested by two justices of the peace, who satisfy themselves that the applicant comes within the meaning of the Act, and who explain to him the effect of his application for admission into a retreat and his reception therein; these

justices further have to state in writing that the applicant understood the effect of his application.

The applicant, after his admission and reception into such retreat, unless discharged or authorised by licence to leave, is not entitled to do so till the expiration of the term mentioned in his application, and may be detained till the expiration of such term; provided that such term does not exceed the period of twelve calendar months. Any person admitted under the Act into a retreat may, at any time, be discharged by the order of a justice, upon the request in writing of the licensee of the retreat, if it shall appear to such justice to be reasonable and proper.

A justice may, at the request of the licensee of a retreat, grant a licence permitting the habitual drunkard to live, away from the retreat, with any trustworthy and respectable person who is willing to take charge of him. Such a licence is in force for two months only, but may be renewed for further periods of two months from time to time until the whole period of detention has expired. The time during which the habitual drunkard is absent from the retreat under such a licence is reckoned as part of the time of his detention in the retreat; if, however, the licence be forfeited or revoked, the period of absence is not allowed to count. If while absent under such a licence the habitual drunkard escapes from the person having charge of him, or refuses to be restrained from drinking intoxicating liquors, he forfeits the licence, and may be taken back to the retreat. A period of unauthorised absence from the retreat is excluded from computing in the time during which he may be detained. If a person detained in a retreat wilfully break the rules thereof, he is liable upon summary conviction to a penalty not exceeding five pounds, or to imprisonment for a period not exceeding seven days; after the imprisonment he is taken back to the retreat until the expiration of his prescribed period of detention. A magistrate or justice has the power to issue a warrant for the apprehension of an habitual drunkard who has escaped from a retreat, or

from the person in whose charge he has been placed under licence ; after apprehension he may be sent back to the retreat by order of the magistrate or justice.

The Acts apply, with certain provisions as to technical procedure, to Scotland and Ireland, as well as to England.

The distinction between the restraint of a lunatic and an habitual drunkard is that the lunatic may be placed under restraint against his will ; the habitual drunkard can only be detained with his own consent and for a limited time.

LIFE INSURANCE

CHAPTER XLIII

Life insurance—Presumption of death—Conditions connected with the granting of policies.

LIFE insurance is a contract by which an individual agrees to pay a certain sum called a *premium*, generally in yearly or half-yearly instalments, to an insurance company, the directors of which on their part agree to pay a stipulated sum of money to the executors or assigns of the insured at death, or to the insurer at some definite period of his life. The deed by which this contract is made is termed a *policy*.

Although the duration of a single life is a most uncertain factor, yet the average duration of a number of lives is a fairly certain quantity. So that, given a healthy life, and the absence of any special risk, the only matter for the consideration of an insurance company in fixing the premium is the age of the applicant. If on account of the presence of disease, or the predisposition thereto, a life is not considered a first-class one, it is usual, if the insurance company propose to grant a policy, to add a certain number of years to the age of the applicant and to demand a correspondingly increased premium. In such cases the estimation of the probable duration of life is made by the chief medical adviser of the insurance company.

Presumption of death.—In a case of the mysterious disappearance of an insured person, and no clue to his whereabouts being obtainable, the law allows an interval of seven years to elapse before payment can be pressed. Unless there

be reason to suspect fraud, an insurance office, under the conditions mentioned, usually makes the payment after the lapse of a year or two.

Conditions connected with the granting of a policy.—The person applying to be insured is required to submit himself for examination by the medical examiner of the office. In conducting a medical examination the physician should carefully enquire into the family history, previous health, and habits of the applicant, especially with regard to the amount of stimulants taken; a systematic and thorough examination of the respiratory, circulatory, alimentary, nervous, and genito-urinary systems should then be made.

The principal condition of the policy, as most affecting the expectation of life, is the general health of the applicant. The printed questions concerning this that are addressed to him should be answered truthfully; if it be subsequently found, by concealment of the existence of disease or of bad habits, that a fraud has been perpetrated, then the contract will become void, and the amount of the premiums already paid will be forfeited.

Some insurance companies send a separate form of questions to the ordinary medical attendant of the applicant, requesting answers to the questions. It is optional for the medical attendant to answer these questions or not, but if he does so and accepts a fee, he must answer them fully and without reserve.

In connection with the habits of an applicant the question of intemperance is one that is most difficult to form a correct estimate of. Perhaps it is best to regard 'intemperance' as a habit prejudicial to the health and life of the special individual. In connection with intemperance it is therefore necessary to take into consideration the general circumstances of an applicant's life. For instance, a person leading a sedentary life would probably be more injuriously affected by excess of alcoholic liquors than if plenty of out-door exercise were taken. The opium, chloral, or other habits may affect the

health and life of an individual, and therefore require consideration in connection with life insurance.

The relationship of suicide to life insurance has been the source of frequent litigation in the past, as insurances offices formerly used to bar death from suicide. It is the custom with many offices now to take the risk of suicide along with other risks, provided that the suicidal death does not occur within a certain period, which is fixed by most offices at one year after the payment of the first premium. Some insurance offices, however, retain the custom of returning to the heir or assign of a policy-holder who has committed suicide the money, without interest, which has been paid in premiums.

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