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POST-MORTEM EXAMINATIONS

IN

MEDICO-LEGAL AND ORDINARY CASES

JACKSON CLARKE

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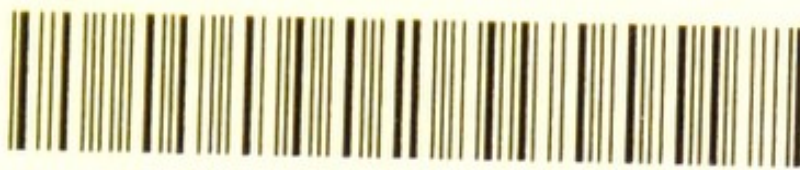


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POST-MORTEM EXAMINATIONS

IN

MEDICO-LEGAL AND ORDINARY CASES

WITH SPECIAL CHAPTERS ON THE LEGAL ASPECTS OF
POST-MORTEMS, AND ON CERTIFICATES OF DEATH

BY

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PREFACE

SOME justification is needed for the publication of yet another book on a subject which has been dealt with by the first of living pathologists, Virchow, as well as by other able writers. This justification, it is hoped, may be found in two special features which this small work presents. One of these is the description of a simple system of antiseptic precautions, which, after a trial extending over five years, the author believes will be found capable of removing every danger from post-mortem work ; the other is the addition of special sections on the legal aspects of post-mortems, and on granting of certificates of death ; matters closely related to medico-legal cases.

The author desires to express his indebtedness to Dr. Danford Thomas, Coroner for Central London, for much kind help and counsel in the preparation of this book.

J. J. C.

LONDON : 1896.

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POST-MORTEM EXAMINATIONS

INTRODUCTION

EVERY medical practitioner is liable to be called upon to give evidence in the law courts respecting deaths that have occurred in circumstances that render it evident or possible that other than natural causes have been at work. Both for the ends of justice and for his own reputation's sake it behoves the medical man on such public occasions, not only to testify as a common witness in a clear and simple manner to *facts* that he has observed, but also, when appealed to for his *opinion* as an expert witness, to be able to state fully the grounds on which such opinion is based. Since in most cases the medical evidence includes the statement of the results of a post-mortem examination, the student should familiarise himself by practical work in

the dead-house with the technical details of post-mortems, as well as with the common appearances of the organs in pathological conditions and after fatal injuries. The following pages are intended to help the student to acquire this knowledge, and to assist the practitioner to refresh his memory when called upon to exercise an art that may have become unfamiliar by reason of long absence of the need of practising it.

PRELIMINARY OBSERVATIONS

Antiseptic Precautions.—In post-mortems, especially where pus is present, as in surgical operations in septic cases, there is a twofold danger. The first danger is to the operator, the second to his patients. The danger to the operator can be eliminated in the most simple and complete manner without in the least degree impairing the efficacy of the examination. It is only necessary to wear photographer's gloves, which can be obtained at any indiarubber shop for 5s. 6d. a pair. They are made of 'stockinette' covered with indiarubber, and with care will serve for between thirty and forty examinations. The

size No. 2 fits an average man's hand, the other sizes being 00, 0, 1, 3, and 4. They do not impair the power of holding moist and smooth viscera, and after a little practice they will be found not to interfere seriously even with the sense of touch. If the knife should touch the glove, the hand is, in the writer's experience, drawn away before the skin is reached. These gloves are infinitely better than those made of indiarubber alone; the latter are slippery and, hence, dangerous. The gloves are to be put on before the autopsy is begun, and should not be taken off until everything, to the cleansing of the instruments, is finished. They should then be washed rapidly in soap and water, whilst still on the hands, rinsed in carbolic solution, then carefully and gently dried on a towel. Care should be taken to avoid pricking the gloves, and a piece of lint should be used when it is necessary to grasp rough edges of bone. No blood or liquid must be allowed to enter the upper ends of the gloves, and as soon as the rubber coating shows signs of wear they should be discarded for a new pair. Since the use of gloves of this kind was introduced into the post-mortem room at

St. Mary's Hospital by the author, five years ago, there has not been a single case of post-mortem wound, although in this period over 120 students have worked in the department.

To avoid the second danger, that of conveying septic material to surgical or other cases, precautions simple in themselves, but requiring a sound practical knowledge of anti-septic measures, must be employed. An apron of stout jaconet, reaching from the chin to the feet, should be worn, and a coat¹ made of drill or other washing material should be kept in the instrument bag, and should be worn throughout the operation. The sleeves of the coat should be shortened by two inches or more, and a cuff of jaconet should be made to line the sleeve inside and out for the lower three inches; the seam in the jaconet cuff should be placed at the back of the sleeve. Before putting on the coat the shirt cuffs should be turned back, and the sleeves of the vest drawn over them to keep them out of the way. After the operation the instruments and sponge are washed first in water and then left for a

¹ Suitable coats can be obtained ready-made in London for a few shillings.

few minutes in carbolic ¹ solution of above 1 to 40 strength. The instruments are dried on a towel and put away in the bag. Any spots on the apron are sponged away with carbolic, and the apron is then dried with the towel, taken off, and put away. The cuffs are to be treated in the same way as the apron. The sponge is well washed in carbolic solution, squeezed as nearly dry as possible, and put away in a jaconet sponge-bag. The gloves, which have been on the hands all the time, are now fairly clean; the grease should be removed by quickly washing them whilst still on the hands with a little soap; finally, it may be repeated, the gloved hands are well rinsed in carbolic solution, and dried without too much friction on the towel. When the gloves are removed the hands are in the same state of cleanliness as they were before the operation; in hot weather they are moist from perspiration. These details

¹ The author has found that 1-40 carbolic kills anthrax spores on threads in 1 minute. Pure liquid (90 per cent.) carbolic acid can be obtained at 1s. 6d. a pound, and 1 fl. ounce of this makes a quart of lotion. The light brown carbolic, which answers the purpose well, is only 2s. 9d. a gallon; a stronger (1-30) solution is required when the commercial acid is used.

take some time to describe, but they give in reality surprisingly little trouble, and if they are duly observed there is not so much danger in performing any surgical operation immediately after making a post-mortem examination as there is in going from one surgical operation in which pus is encountered to another.

The usual antiseptic precautions are no more to be omitted after an antiseptic autopsy than they are in other circumstances. The most powerful antiseptic for cleansing the hands and wounds is the biniodide of mercury and potassium.

Experimentally, the author found that a 1 in 5,000 solution of the biniodide killed anthrax spores in one minute, whilst the same strength of perchloride had no effect. If to a 1 in 1,000 solution of perchloride, potassium iodide solution be added till the precipitate is dissolved, a perfectly satisfactory antiseptic is obtained for the hands. For washing wounds a 1 in 2,000 biniodide solution is sufficiently strong. It must not be allowed to come in contact with the instruments, for which boiling in a 1 per cent. solution of washing soda is the best precaution. Silk for sutures &c. should be boiled

in 1 in 20 carbolic, as the soda solution makes it brittle. Chromicised gut must be kept in 1 in 20 carbolic for at least twenty-four hours before operating. These and other well-known precautions must never, of course, be omitted. During the last five years the author has been constantly engaged in pathological and also in surgical work, and with but one exception he has not had a failure in the aseptic course of any surgical wound made in non-suppurating tissues. The exception was in the case of an amputation of the breast. During this operation an explosion of gas occurred in a lamp over the table and shook down a shower of dust into the wound, and in spite of washing with 1 in 20 carbolic suppuration ensued, but without seriously interfering with repair.

Those who are engaged in midwifery practice should employ a skilled assistant to make the dissection of the body, if they are not prepared to carry out these antiseptic measures to the least detail.

Instruments, &c.—The instruments should not be too numerous. They should include an ordinary dissecting-case provided with a pair of scissors, having one point blunt, a probe, and

a packing-needle ; a section-knife, a cartilage-knife, and a long straight amputation-knife for slicing the larger organs ; a pair of bone forceps, a saw, which should have a hinged movable back to allow of sections being made of bones of any depth ; a mallet and a chisel (the shank of the latter should be at least 4 inches in length), a catheter, an empty bottle for urine, and a reel of white twine should also be provided.

The instruments are best kept in a stout leather bag used for this purpose only, and the larger knives can be kept loose in the bag in leather sheaths.

A clean wide-mouthed stoppered glass jar¹ should also be in the bag ready to receive the contents of the stomach in cases of poisoning, and a piece of sealing-wax. There should be a 2-oz. stoppered bottle containing one part formalin² to nine of water for pieces of tissue to be cut for microscopic examination. Slices of

¹ To clean the jar, first scour it out well with sand, then rinse it with strong hydrochloric acid, and afterwards wash it thoroughly with water.

² This can be obtained from A. & M. Zimmerman, 9 and 10 Mary-at-Hill, E.C. The price per lb. is 2s. 6d. net.

tissue $\frac{1}{6}$ inch in thickness placed in this solution for twenty-four hours, and then transferred for a few hours to mucilage, give satisfactory sections with the freezing microtome. A small bottle of liquor (not tincture) iodi should also be ready to test for amyloid disease.

Preserving Specimens for Museum Purposes.—After being well washed in running water for some hours, to remove as much blood as possible, the specimen is placed in a solution made by adding $1\frac{1}{4}$ fl. oz. of formalin to every 5 pints of water.

THE AUTOPSY

‘No medical man is justified in making an inspection of the body until the chief signs of death—cold and rigidity, or decomposition—have been clearly manifested.’—Stevenson.

Whenever it is possible post-mortems should be made by daylight. An autopsy comprises two sets of observations, the external and the internal examinations.

The External Examination.—In certain cases it is important to take the temperature ¹

¹ The rate of cooling of the body after death is affected by various circumstances. It is proportionate with the difference between the temperature of the body

of the body with the thermometer in the axilla or in the rectum. Rigor mortis¹ and hypostasis² and changes due to decomposition³ are and that of the surrounding medium. The body is usually cold in from 12 to 24 hours.

¹ Rigor mortis, like the spasm of tetanus, begins in the muscles of mastication. The time of its onset and of its duration is affected by various circumstances. It generally commences within five or six hours of death, and lasts from sixteen to twenty-four hours. Rigor mortis disappears when decomposition sets in.

² Hypostasis is due to the gravitation of blood in the small veins. If the handle of a scalpel is pressed on a patch of hypostasis, it leaves a white mark. When an incision is made blood is seen to issue at various points, and not, as in contusions, to be diffused throughout the tissues of the part. Stains due to decomposition and diffusion of blood colouring matter must be distinguished from contusions, &c.

³ The date of appearance of the changes due to decomposition varies greatly according to the external temperature, &c. The greenish discoloration of the abdomen is seen generally on the second or third day. Burial in earth retards decomposition. If the body is in water the changes begin on the face and spread downwards. Adipocere generally begins to form in two or three months if the body is in water, in eight to ten months if it is buried in damp soil. In cases of advanced decomposition, the systematic course of the post-mortem must be modified. Identification may be impossible. The sex can usually be ascertained, because the uterus is one of the last of the organs to undergo disintegration.

to be looked for, and their degree noted. When the body is that of an unknown person, or when the identity of the individual is doubtful, the height, complexion, character of the hair, peculiarities of the teeth, deformities, moles and scars should be noticed. Indications of injury before death are to be carefully looked for. Each wound must be carefully examined and described. Discolorations resembling bruises must be examined by incision in order to ascertain whether they are caused by extravasated blood. Purpuric and other extravasations closely simulate the results of contusions. The orifices, mouth, vagina, rectum, &c., must be examined for foreign bodies. Marks of corrosive poison about the lips and in the mouth and on other parts of the body must be noted. In cases where rape is suspected to have taken place the vulva must be carefully inspected, and materials which may contain spermatozoa removed for microscopical examination. In the case of new-born infants special observations must be made as indicated below (p. 60).

The Internal Examination.—In this part of the autopsy all the cavities of the body, abdomen, thorax, and head, are to be opened. They

should be opened in the order just given, unless there should be definite indications that the cause of death is to be found in a particular cavity. Thus in the case of a bullet-wound of the forehead the dissection of the scalp, skull, and brain would naturally be performed as a continuation of the external examination, but although it might seem evident that this wound was the cause of death the thorax and abdomen should also be carefully examined and reported on. After the abdomen has been opened the height of the diaphragm can be recorded in relation to the ribs in the nipple-line on each side. This done, the front of the thorax should be removed, care being taken to avoid injury to the large veins at the root of the neck, and consequent escape of blood which would alter the state of the right auricle and ventricle—a matter of importance in cases of death from drowning and strangulation, and other forms of asphyxia. After removing the front of the thorax, opening the pericardium and inspecting the superficial appearance of the heart, the skull-cap should be removed and then the dura mater turned back so that the state of the superficial veins of the brain may be observed

before any blood is allowed to escape from the heart. In infants, and in certain pathological conditions which cause the dura to adhere to the skull, in adults also, the dura mater should be divided all round and removed with the skull-cap. It is often convenient to have a form similar to that given on page 50 for recording the facts observed.

Detailed Description of the Opening and Dissection of the Body.—The operator standing on the right side of the cadaver inserts the point of the knife beneath the symphysis of the jaw, and divides the skin and fat in the middle line downwards to the symphysis pubis. This done the incision is deepened along and below the xiphoid cartilage till the peritoneum is opened for two inches or more.

Opening the Abdomen.—Two fingers are inserted into the cavity and separated so that the knife can cut through the parieties in the middle line of the abdomen without injuring the viscera. Then the knife is passed on the flat behind the rectus muscle on each side in turn, the muscle being divided subcutaneously between the umbilicus and the pubes by turning

the edge of the knife against it. Inserting the fingers of the left hand through the upper part of opening into the abdomen, the soft parts of each side can be drawn upwards and outwards so that the peritoneum is stretched over the costal margin and can be divided by cutting on the ribs, and then by rapid sweeps of the knife the thorax can be cleared of the soft parts, and the skin and the sterno-mastoids can be turned outwards up to the jaws. The same process is then to be repeated on the right side. These manipulations are indicated in fig. 1.

Opening the Skull.¹—A block should now be placed under the neck, and the scalp divided by making an incision from one mastoid process to the other across the vertex, the cut going down to the bone. The soft parts of the scalp being peeled off, the skull is sawn in two horse-shoe-shaped cuts, the ends of which cross each other about an inch above the external auditory meatus; the middle of the anterior saw-cut passes through the frontal eminences; the middle of the posterior is near the apex of the

¹ The apparatus known as the 'Crown' is a great help in removing the skull-cap, but it is by no means indispensable.

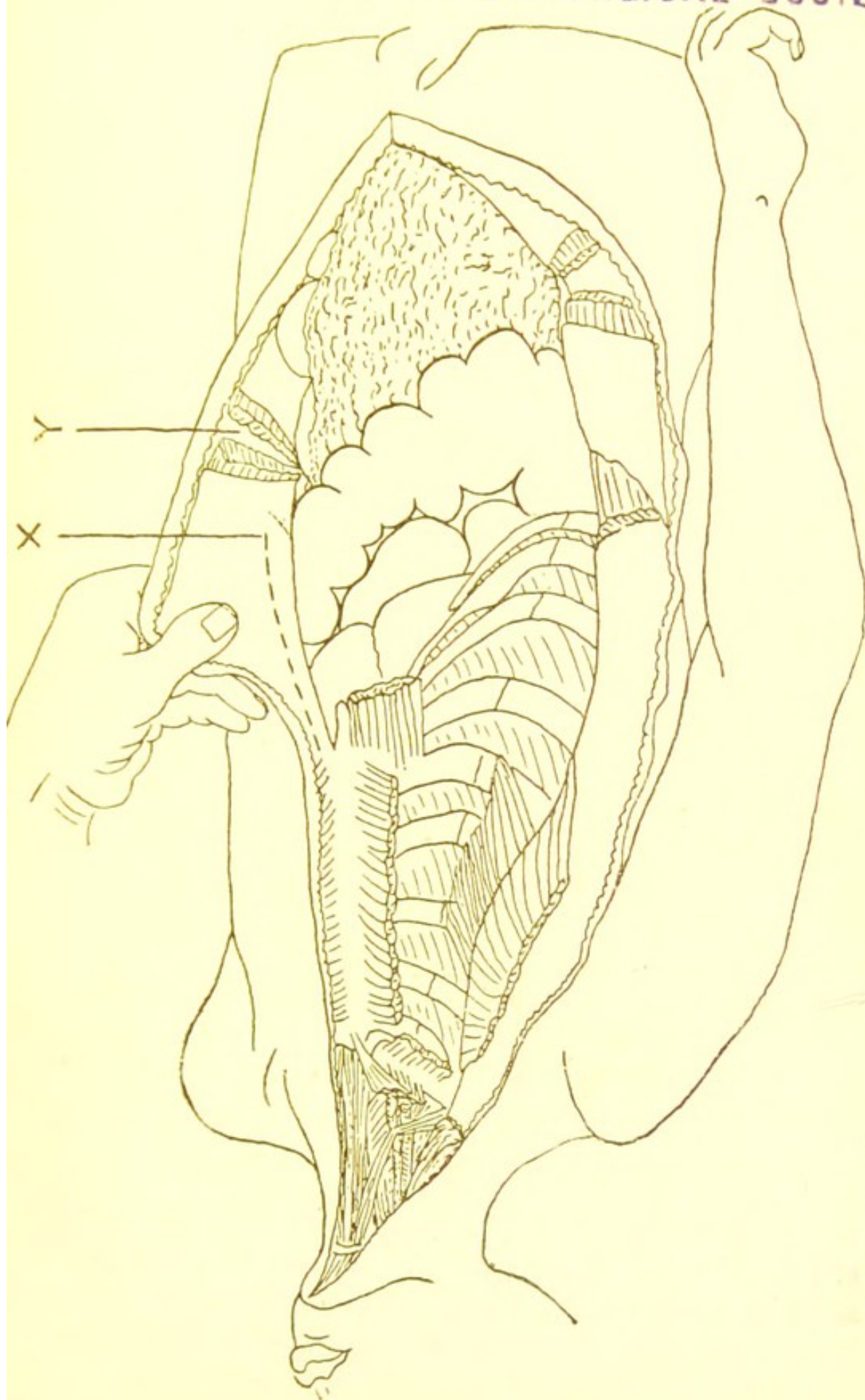


FIG. 1.—The hand shows the manner of drawing the peritoneum over the margin of the thorax, and the interrupted line X indicates the place for incising the peritoneum and the soft tissues. Y shows the divided left rectus.

lambda—*i.e.* about three inches above the external occipital protuberance.¹ The saw-cut is

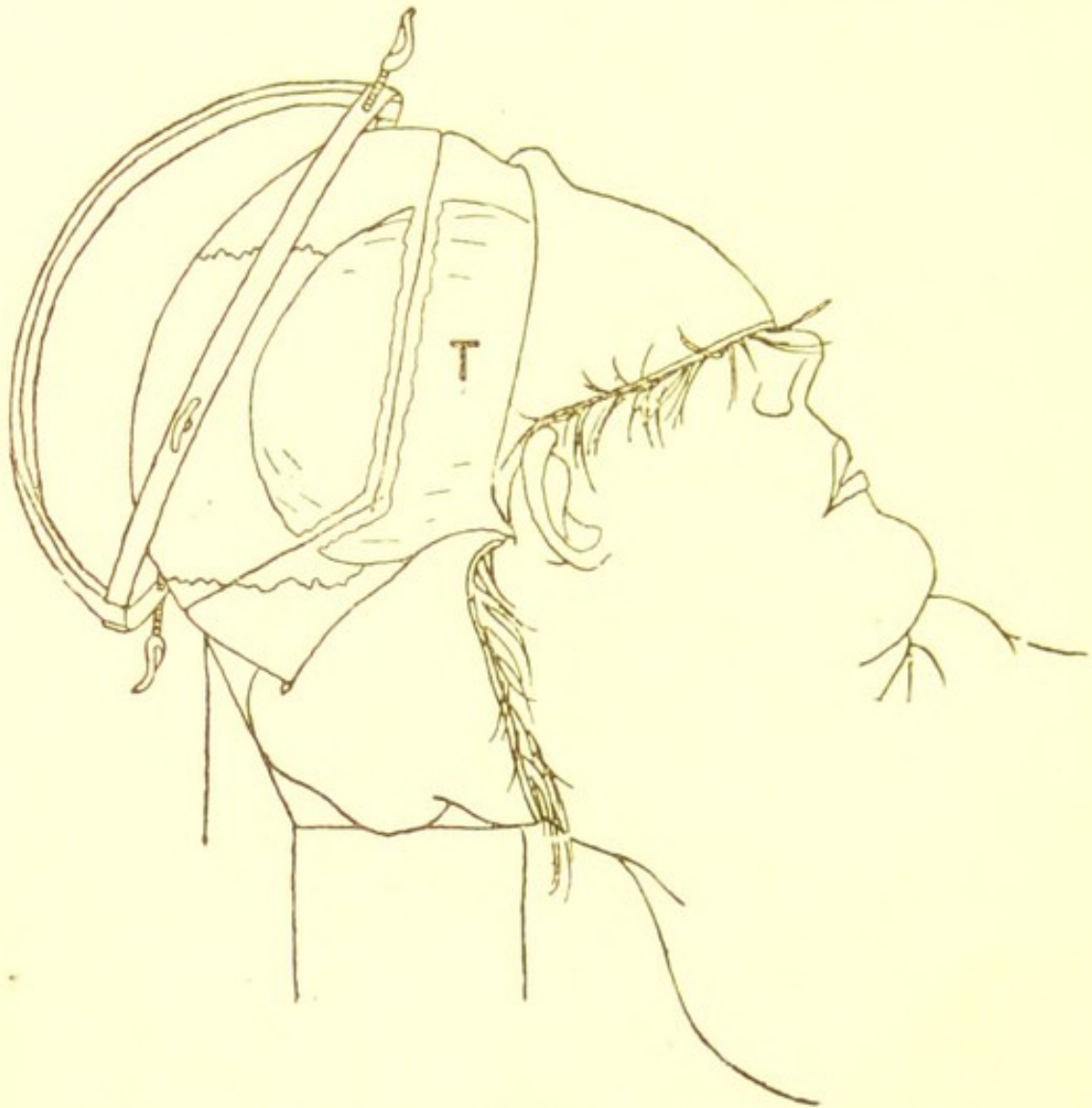


FIG. 2.—The head showing the scalp turned back, the 'Crown' fixed to the skull-cap, and the lines of the saw-cuts. T marks the temporal fascia.

made to reach but not to divide the inner table, the rest of the division being effected by

¹ When the skull-cap is removed in this way the tendency to displacement after the soft parts have been stitched over it is diminished. It may be made still safer by making a horizontal cut with the saw forwards from near each extremity of the anterior horse-shoe

light taps of the chisel (see fig. 2). Difficulty is sometimes experienced in making the posterior saw-cut. This is overcome by rotating the head to the right, beginning the cut well

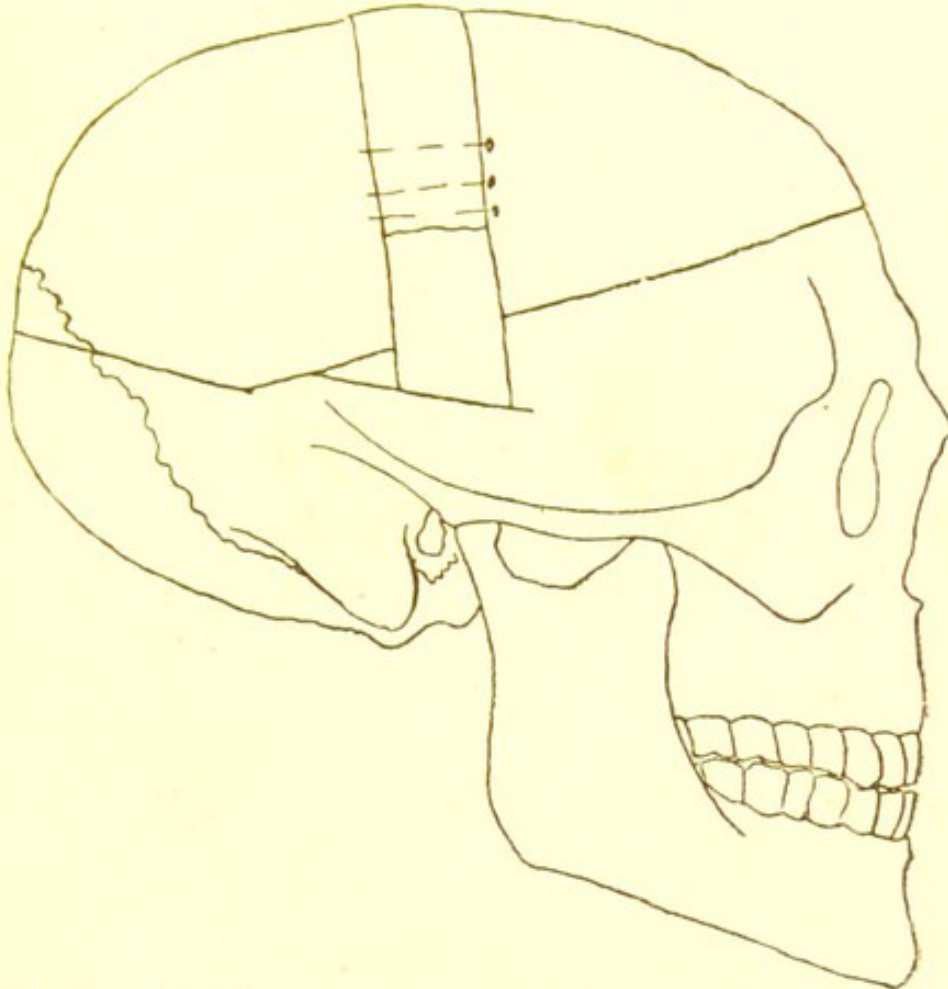


FIG. 3.—A skull showing the mode of fastening the skull-cap by a bandage.

round to the left side. The dura mater is incised all round, except in the middle line behind. The falx cerebri must be remembered saw-cut and slipping a piece of bandage in the cuts, and after the skull-cap has been replaced pinning the ends of the bandage together over the vertex, as shown in fig. 3, or instead of this the parts of the temporal fascia may be stitched together.

in doing this. The dura is then inspected, and turned back, exposing the cerebral convolutions. In young infants the skull bones and dura mater can be divided simultaneously by a strong pair of scissors. When the brain is exposed the state of the superficial cerebral veins is to be noted.

Before removing the front of the bony thorax the *height* of the *diaphragm* should be taken by pressing gently with the forefinger in the dome of each side, sweeping the finger forward in the mid-clavicular line, and noting at which rib or intercostal space it is arrested. This observation is of interest in cases of intestinal obstruction, &c.

Opening the Thorax.—The cartilage-knife is passed round the sterno-clavicular joints, a manœuvre which can only be learnt by practice, and which is facilitated by the use of a rather narrow knife. The first rib-cartilages are more easily divided by levering the back of the knife on the second cartilage; the succeeding cartilages are divided close to their junctures with the bone, the edge of the knife being turned somewhat outwards, so that it may not cut deeply into the lungs. When the

costal cartilages are calcified they must be cut through with the bone forceps. Now, by lifting forwards the lower part of the sternum with the left hand, and making a succession of cuts on the under surface of the sternum and costal cartilages, the front of the thorax is separated.

The Examination of the Thoracic Viscera.

The *Pericardium* is first to be opened by cutting along its lower and right lateral borders. The amount of fluid and other peculiarities are to be noted. If pericardial adhesions are present, it facilitates the subsequent examination of the heart to break them down (when this is possible) by the fingers.

The Heart.—Note its size (this should equal that of the closed fist of the individual in question), and the state of the cavities, whether distended with blood or otherwise.¹

¹ Three modes of death, first described by Bichat, are recognised: 1, by coma, 2, by asphyxia, 3, by syncope. When death occurs in a state of coma *e.g.* from cerebral hæmorrhage or opium poisoning, the actual dissolution is due to gradual paralysis of the respiratory centre, and hence the state of the heart resembles that observed in asphyxia; *i.e.* the right

To open the Right Cavities of the Heart.—

Take the apex of the heart between the forefinger (behind) and the thumb (in front), draw the apex to the left and rotate the heart to the left, so that the right border of the heart looks forward and the points of entry of the two cavities of the heart are full of blood, the lungs are congested and often œdematous, the great veins are overfull. The small extravasations of blood (petechiæ) seen beneath the serous membranes when death has taken place from rapid asphyxia are usually absent when death is due to coma. In death from syncope, two different conditions are observed. If the heart-failure has been due to loss of blood, the left cavities are practically empty, if it is due to paralysis of the left ventricle, as in aortic regurgitation (fig. 8), the left ventricle is full at the time of death, but it must be remembered that it may empty itself into the left auricle when it contracts in rigor mortis and so be found empty at the autopsy. Another common cause of death in elderly persons who are fat and emphysematous is heart-failure from displacement by dilatation of the stomach. In the case of a man who fell down and died in a street, the author found the stomach, which contained much undigested food, so greatly dilated in an upward direction that the fundus had pushed up the thinned-out left leaf of the diaphragm to the level of the first intercostal space. The heart's apex was displaced to the right of the middle line. All the organs were fat-laden, but there was no obvious fatty degeneration of the heart. The ventricles were empty.

venæ cavæ into the right auricle come into view; then make an incision in the auricle

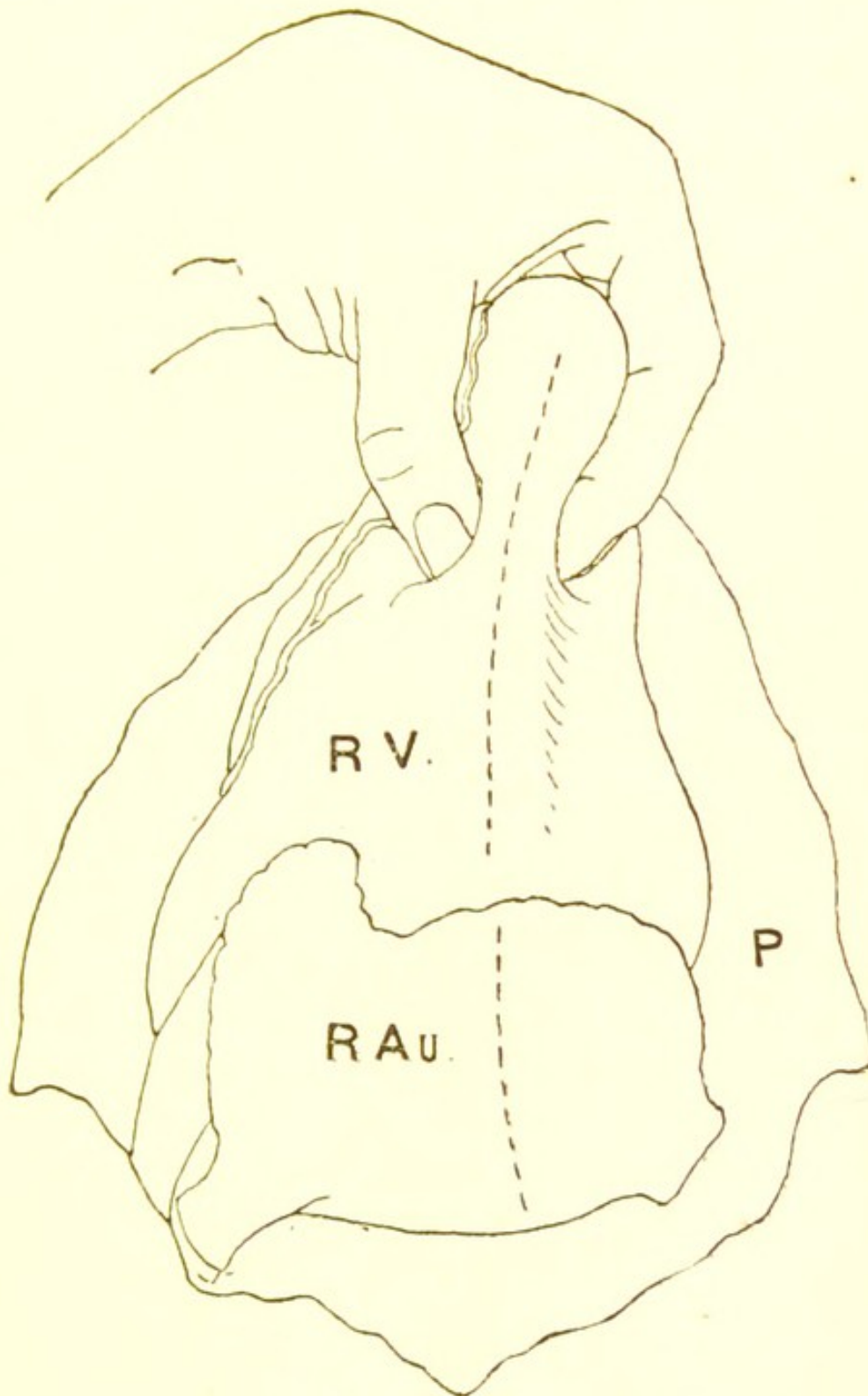


FIG. 4.—Shows the mode of holding the heart to make the first incisions (marked by the interrupted lines) in the right auricle and ventricle. P, pericardium.

from close to the auriculo-ventricular groove to a point about midway between the points of entry of the two venæ cavæ (see fig. 4). Remove and note the quantity and quality¹ of the blood in the two cavities, measure the size of the auriculo-ventricular orifice by inserting as many fingers of the left hand as it will admit side by side. In the adult the normal orifice admits three gloved fingers.

To open the Left Cavities of the Heart.—

Take the apex in the left hand between the fingers (in front) and the thumb (behind), and draw it upwards towards the chin as shown in

¹ Blood-clot that forms after death is either of the 'currant-jelly' or 'buffy' (pale gelatinous) kind. Antemortem clot when formed shortly before death is tough and stringy, and varies in colour from pale pink to rusty red. It is well seen after acute pneumonia, &c. Clots that have been in the heart a long time, *e.g.* in the left auricle in mitral stenosis, are friable and sometimes adherent to the heart wall, and partly organised. Some old clots are decolorised, having the dirty whitish colour of decolorised infarcts. Clots often extend into the pulmonary arteries, and not infrequently into the aorta. In aneurisms, the clot that forms before death is laminated. The peculiar 'strawberry-cream' clot is seen in death after severe leucocythæmia. After acute poisoning by carbon monoxide the blood is bright red in colour and shows but little tendency to clot.

fig. 5. The incision in the left auricle begins at the upper left pulmonary vein, and passes obliquely downwards and to the right, stopping short of the coronary sinus and of the right auricle. The first incision in the left ventricle is made in the left border of the heart, beginning

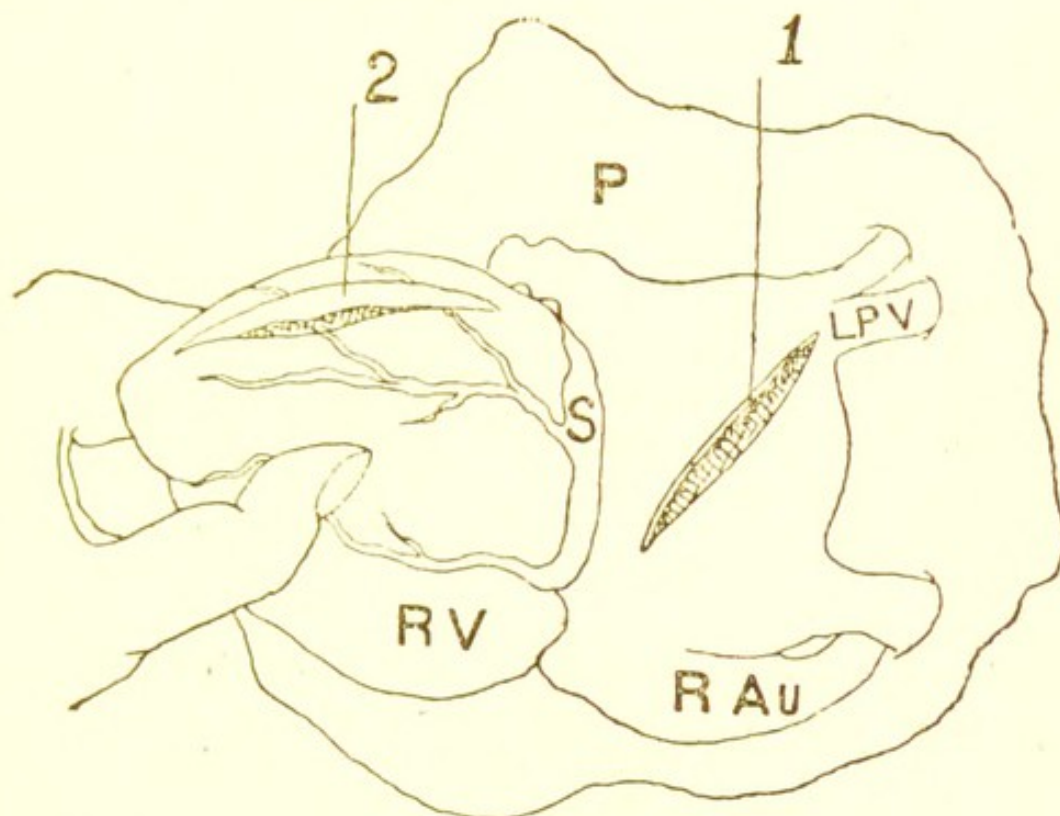


FIG. 5.—Showing the incisions in the left auricle (1) and ventricle (2). P, pericardium; S, coronary sinus. LPV, upper left pulmonary vein.

close to the auriculo-ventricular groove and ending near the apex. Turn out the blood and clot from the cavities, noting its amount, &c.; estimate the size of the mitral orifice. It should admit the tips of three gloved fingers held abreast. The heart may now be removed

from the body by cutting the venæ cavæ, the aorta, the pulmonary artery and veins close to the pericardium. It should now be weighed, and if necessary the hydrostatic test

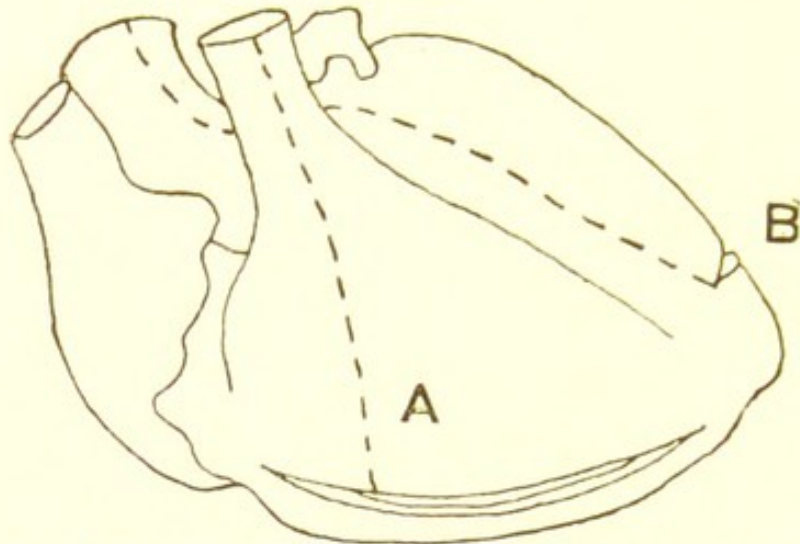


FIG. 6.—A heart showing the additional incisions (the interrupted lines) for completely opening up the ventricles. A and B are placed near the points of junction of the second with first incisions.

applied to the aortic valves, and the opening of the ventricles completed by the incisions shown in fig. 6.

In the case of the right ventricle the second incision begins near the upper end of the first, and after a finger has been passed into the ventricle through the first incision to ascertain the point of attachment of the anterior papillary muscle, the cut is made above this muscle through the pulmonary valves. The condition of the valves may be ascertained.

The second cut in the left ventricle begins at the lower end of the first and passes up close to the interventricular septum to the left side

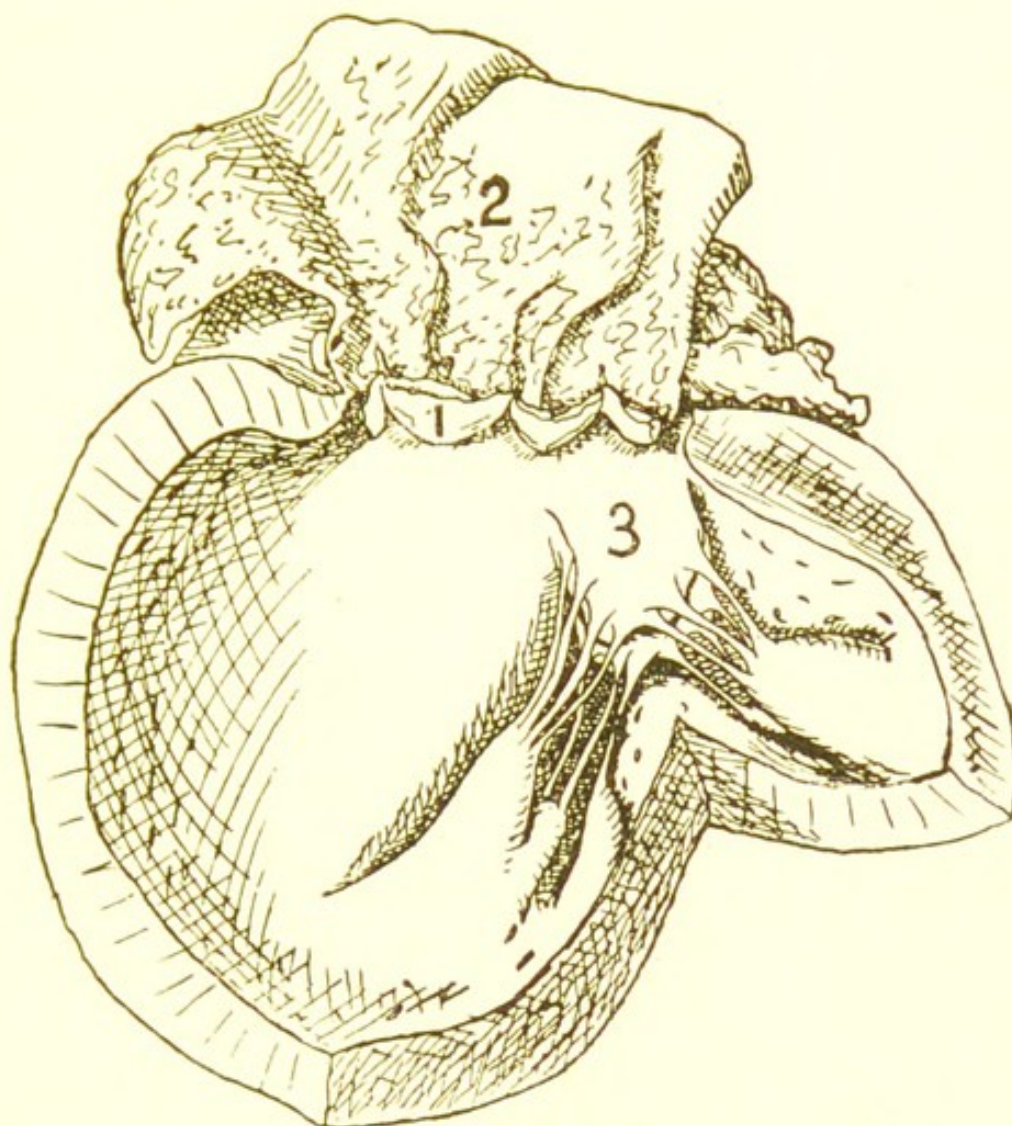


FIG. 7.—The left ventricle and the aorta opened. The ventricle is greatly dilated and hypertrophied, the aortic valves (1) are deformed from chronic endocarditis (atheroma), the aorta (2) is greatly dilated and covered by atheromatous patches. The mitral valve (3) is normal. From a middle-aged man who died suddenly after being from aortic regurgitation for some years.

of and behind the pulmonary artery, and on into the aorta, the root of which it divides at or near the junction of the anterior and left

posterior flaps of the aortic valve. The condition of the aortic and mitral valves¹ is now ascertained. The appearance of the left ventricle &c. when opened by these incisions is shown in fig. 7. The heart muscle should be searched for evidence of fatty degeneration,² the aortic openings of the coronary arteries should be examined to see whether there is any blocking by atheroma, and the coronary arteries³ slit up.

¹ Vegetations are to be looked for at the edges of the valves. The vegetations are abundant and friable in ulcerative endocarditis. The bases of the aortic, and less frequently of the mitral valve, may contain calcareous masses due to atheroma. In moderate atheroma of the aortic valve a sudden strain may cause rupture of a flap, then the person's life is shortened. If recovery from the immediate attack of dyspnœa &c. occurs, signs of aortic incompetence develop.

² In anæmia the fatty change is shown by the 'tabby-cat' yellow mottling of the heart muscle, in atheroma of the coronary arteries the fatty change shows itself by yellow streaks.

³ In a case examined by the author in which death occurred suddenly two hours after chloroform had been given for an operation, both coronary arteries were found to be plugged by recent emboli consisting of blood-clot. One of the commonest causes of sudden death in persons who have not had very marked symptoms is rupture of an intrapericardial aneurism of the aorta.

Removal of the Lungs, &c.—After the examination of the heart is completed, the *Pleuræ* are examined, any fluid or lymph that they may contain being noted. This done, the remaining thoracic viscera are removed, together with the soft palate, tongue, pharynx, &c. A narrow knife is passed on the flat from the opening in the neck behind the right half of the body of the lower jaw into the mouth, and the mucous membrane of the mouth is divided along this portion of the jaw.

The right forefinger is passed into the mouth from this incision and the tongue is pulled down, and the soft parts are cut from the left half of the jaw, so that the soft palate¹ becomes visible through the incision, and now the narrow knife is entered between the hard and the soft palate and is made to detach the latter from the former, and laterally to cut through the arches of the palate above the tonsils. The posterior wall of the pharynx is next cut through, and the tongue, soft palate, pharynx, and larynx, are separated by a few strokes

¹ In new-born infants foreign bodies in the pharynx should be looked for.

of the knife down to the root of the neck, where the large vessels are divided as they pass into the neck, and then by making strong traction on the liberated portions of the trachea and œsophagus in a downward direction, the lungs, aorta, and œsophagus can be drawn downwards and forwards out of the chest. Before severing the aorta and œsophagus above the diaphragm, a ligature must be passed round the lower end of the œsophagus to prevent the contents of the stomach from escaping.¹ This done, the œsophagus and aorta are cut through and the thoracic viscera removed.

The aortic arch and its large branches and the thoracic aorta are opened and their condition is noted.

The condition of the *tongue* and *tonsils*, *thyroid* and *thymus* glands, having been noted,

The *pharynx* and *œsophagus* are opened in the middle line behind and their condition is observed.

The *thyroid* and *thymus glands* are then examined and cut open.

¹ In cases of irritant poisoning the stomach can be removed in continuity with the œsophagus, a double ligature having been previously placed on the duodenum, which is cut between the ligatures.

The *larynx*,¹ *trachea*, and *bronchi* are then opened from behind in the same way, and their contents and mucous lining &c. are observed.

The larger divisions of the *pulmonary arteries* and *veins* should also be slit up, to see whether there has been embolism or thrombosis.

The *Lungs* are carefully inspected, search being made for areas of collapse, patches of lymph, &c. Then they are palpated, and areas of consolidation, or emphysema, are recognised. The lungs are then laid on their anterior surfaces, and with a long knife a sweeping cut is made from the posterior border nearly through both lobes on the left side, and all three lobes on the right side, and the appearance of the cut surfaces is carefully noted.²

¹ Foreign bodies, œdema, membrane, ulcers &c. are to be looked for in the larynx.

² The examination of the lungs includes search for injuries from fractured ribs, &c. Emphysema gives the familiar feeling of a feather pillow when rubbed between the fingers. It is masked by consolidation. Œdema of the lungs as seen on section by the oozing of frothy liquid is usually an effect of slow dying rather than the cause of death. After death from drowning the lungs are increased in size and boggy from inhaled water. The appearance of red hepatitis is to be distinguished from that of collapse. In the former the affected part of the lung is enlarged,

The *bronchial glands*¹ are next examined, and sections of them are made to show caseous patches, &c.

Removal and Examination of the Abdominal Viscera.—In the abdomen, as in the other cavities, the surfaces of the viscera should be carefully examined before any of them are removed. In this way patches of lymph, tubercles, nodules of growth &c. can be seen and noted before any of the viscera are removed.

By passing the fingers into the foramen of Winslow any thickening about or within the *portal vein*² can be felt, and then the vein, the common bile-duct, and the hepatic artery, can and on section is granular on the surface and friable. Collapsed lung is diminished in size, smooth and dark on section and tough.

¹ In a case investigated by Pepper a child died in convulsions immediately after taking a dose of medicine. The parents thought that the doctor had poisoned it. The post-mortem showed that the contents of a large caseous bronchial gland had escaped into the trachea, which was plugged by caseous material.

² In an obscure case of hepatic abscess, the author found the portal vein to be thrombosed, and on dissection a black bristle, which had doubtless worked its way from the intestine, was discovered within the lower end of the superior mesenteric vein.

be exposed by a little dissection before any of the viscera are removed.

The *Spleen* can be removed easily by taking it in the left hand and dividing the tissues at the hilus. It should be cut open from end to end.

Removal of the Intestine.—A double ligature is placed round the commencement of the jejunum, which is exposed by lifting the transverse colon on to the thorax, and a second double ligature is placed at the upper part of the rectum. The bowel is divided between the two pairs of ligatures, and the jejunum and ileum are separated from the mesentery by rapid sawing cuts, and then the cæcum, with the appendix and the colon, are separated from their attachments and the intestine is set aside to be examined later. A double ligature is placed round the duodenum below the pyloric end of the *stomach*, which is then removed. An opening is made into the anterior surface near the lower border, and in cases of poisoning the contents are evacuated into a clean glass jar furnished with a ground-glass stopper. The incision is extended by scissors from end to end and the mucous surface examined; post

mortem staining and digestion¹ are looked for, and are to be carefully distinguished from inflammatory changes, such as are produced by arsenic or cyanide of potassium (see p. 55). Before removing the liver the *portal vein* in front of the foramen of Winslow should be examined by dissection.

The *liver* may now be removed, the *gall bladder* and *bile-ducts* examined, and then the liver substance sliced by a series of parallel antero-posterior cuts.

In removing the liver the small omentum and the structures in its free edge and behind this the inferior vena cava, the left lateral, the falciform and round ligament, the coronary and right lateral and the upper part of the inferior cava must be divided. In new-born

¹ Post-mortem digestion is most commonly observed in the stomach and lower part of the œsophagus. In the slighter forms it is evidenced by the removal of the epithelium and some staining about the small blood-vessels of the gastric mucosa. When the stomach has been full at the time of death the whole thickness of its walls at the fundus may have been digested, causing a post-mortem perforation. Such a perforation with its gelatinised indefinite edges can hardly be mistaken for a gastric ulcer, which has a well-defined and often thickened edge.

infants the umbilical vein should be examined for thrombosis and the liver for small abscesses.

Among morbid conditions of the liver the so-called acute atrophy is the most puzzling and demands a short notice. The liver presents varied appearances. Usually it is smaller and softer than normal, and has a wrinkled surface, or it may be increased in size and studded with firm pale nodules which may simulate foci of growth.¹ The colour may be red, brown, or yellow, or, what is commoner, a mixture of all three. In the red or brown areas the liver cells have disappeared, and in some cases these red areas are infiltrated with fibro-cellular tissue. In the pale areas there is fatty and inflammatory infiltration. The disease is not an atrophic but an inflammatory affection. The gall bladder may be empty or full of brownish bile. In acute phosphorus poisoning there is a true fatty degeneration of all the tissues of the liver, which is usually enlarged, pale or marbled in colour, and may contain hæmorrhages. The microscope and chemical tests

¹ *E.g.* Cayley's case, *Trans. Path. Soc.* 1888.

may be required to distinguish between the two conditions.

The *duodenum*¹ can now be removed with the *pancreas*² and these organs examined.

The Genito-urinary Organs.—The urine is first drawn off by a catheter and collected.³ The *kidneys* with the suprarenal bodies can be lifted out of their beds after an incision has been made through the parietal peritoneum along the outer border of the kidneys. The ureters should not be cut, but should be raised with the kidneys and freed to the *bladder*. The kidney is held in the left hand and incised from the cortex to the pelvis. The capsule should then be peeled off. The normal relation of the cut surface of the cortex to that of the pyramid where the section passes verti-

¹ Perforating ulcer of the duodenum is occasionally the cause of rapid death.

² In acute pancreatitis the gland is either pink and gelatinous or infiltrated with pus.

³ Especially in young subjects diabetic coma may cause rapid death without any marked previous illness. In such a case it happened at an inquest that the nature of the case for want of a simple test was not made clear; a second examination was made by a different medical man, and the urine was found to be loaded with sugar. (Danford Thomas.)

ally through the middle of the latter is about cortex = 1, pyramid = 3. Large white and contracted granular kidney are the conditions most commonly encountered in medico-legal cases, since the condition of uræmia which they entail often causes mental derangement. In the Penge case, in which it was sought to establish murder by starvation, the medical man who made the post-mortem examination was taken to task for not having examined the *suprarenal bodies*. Tubercle, which alone entails Addison's disease, and cancer are the conditions more commonly occurring.

After the kidneys have been examined the *ureters* should be opened up, and then the kidneys removed and weighed. In the male the testes can be drawn out of the scrotum by making traction on the cord and severing with the scissors the fibrous tissues which connect the lower end of the testes with the bottom of the scrotum. Next, the fibrous structures at the symphysis pubis should be severed¹ by the

¹ In doing this, injury to the urethra in the male and the vagina in the female can be avoided by using the bone forceps to divide the deeper part of the symphysis.

cartilage-knife and bone forceps, and then by abducting the thighs forcibly the two pubic bones can be separated for two inches or more. In the male the median incision should be prolonged on the dorsum of the penis nearly to the glans, and there the penis should be divided, raised up from its bed, and at the root of the organ the corpora cavernosa should be cut through at their attachment to the pubic arch. Then, by pulling upwards the penis and bladder, the prostate can be cut free from the tissues of the perineum till the rectum is reached. The rectum can be cut through on a level with the base of the prostate, and all the pelvic organs can be removed, and after the rectum has been washed out, examined. The *urethra* and *bladder* are opened by a pair of blunt-pointed scissors along the mid-ventral aspect. The *seminal vesicles* and *prostate* may also be incised. The *rectum* can be cut up along its dorsal aspect.

The Removal of the Pelvic Viscera in the Female.—In cases where criminal abortion is suspected (see p. 56) this is a matter of considerable delicacy, inasmuch as punctures &c. made in careless removal may be mistaken

for injuries received during life ; though to a practised eye the sharp clean edges of a post-mortem wound distinguish it from the rounded injected edge of a wound inflicted some days before death. The method of removing the viscera is similar to that described in the male. The bladder, uterus and rectum being freed from above down to the outlet of the pelvis, and the pubic bones having been sprung apart after division of the symphysis, the vertical incision is prolonged into the vulva to the dorsum of the clitoris, from which point two elliptical cuts are made to pass just outside the labia minora and meet below the fourchette. By deepening these incisions the clitoris and the mucous membrane and the structures beneath them are divided. The rectum is then cut through and the viscera removed. The urethra and bladder are opened as in the male. The vagina is then cut open along its mid-anterior aspect as far as the os uteri. The fornices and the os uteri are examined for punctures, fissures, &c. Then the *uterus* is opened in the middle line in front. If it is very tough it may be incised by the knife

through half its thickness, the rest being done by the blunt-pointed scissors. The *ovaries* are incised in their long axis, and the *Fallopian tubes* examined, if necessary, by cutting them open.

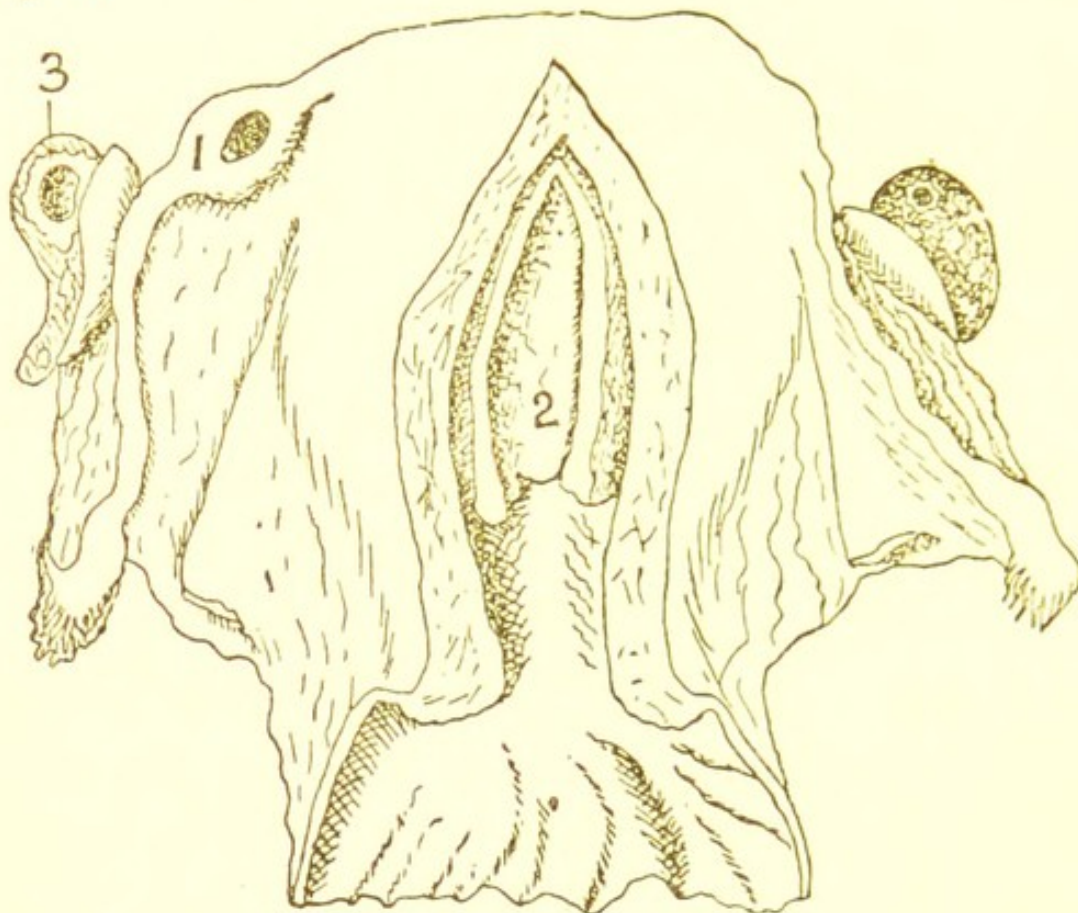


FIG. 8.—Uterus and appendages. The uterus has been opened from before. The left Fallopian tube is dilated and ruptured near its junction with the uterus (1), from the escape of a minute ovum. The uterus is enlarged, and contains a decidua (2). The left ovary contains a large corpus luteum.

A perforation in one of the Fallopian tubes associated with blood in the peritoneum or in one of the broad ligaments is due to a ruptured tubal pregnancy. In such cases the embryo and the chorion should be looked for. The

uterus contains a decidua as in normal pregnancy (see fig. 8).

For a simpler mode of dealing with the pelvic viscera see the section on 'Post-mortems in Private Houses,' page 45.

The *brain* is removed in the usual way, care being taken to incise the tentorium along the upper borders of the petrous bones, and to divide the spinal cord well below the foramen magnum. After noting the state of the arachnoid, pia mater, the convolutions,¹ and the arteries at the base, the brain is placed on its under surface with the frontal lobes farthest from the operator, and then the *lateral ventricles* are opened by cutting vertically through the corpus callosum on each side near the middle line for an inch, and then extending these incisions by passing the knife

¹ It is best to *palpate* as well as *inspect* the surface of the brain. In a case examined by the author, that of a woman who was brought in a dying state to St. Mary's Hospital with a history of a series of fits which began in the right arm and leg, nothing abnormal could be *seen*, but an indurated area could be *felt* at the lower end of the left ascending frontal and parietal convolutions. On cutting into the part but little change could be detected by the naked eye; on microscopic examination a syphilitic infiltration was found.

horizontally outwards and cutting forward at the anterior and backwards at the posterior extremity of the first incisions (see fig. 9). The lateral ventricles and their choroid plexuses

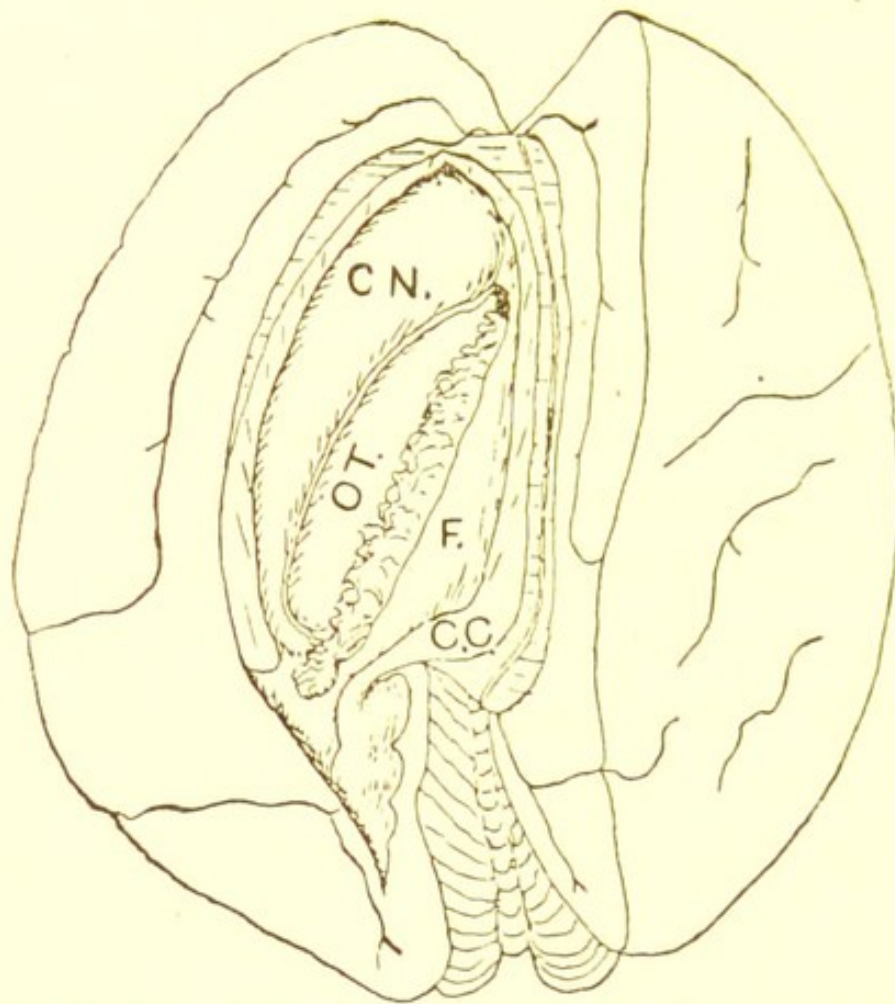


FIG. 9.—A brain in which the left lateral ventricle has been opened. CN caudate nucleus, OT optic thalamus, F fornix. Between the optic thalamus and the fornix is the choroid plexus, at the anterior extremity of which is a dark spot—the foramen of Monro.

are examined. The point of the knife is then passed through the foramen of Monro, and the fornix and the remaining median portion of the corpus callosum are cut through

and turned back, exposing the velum interpositum with the veins of Galen. The velum is lifted up and turned back, exposing the third ventricle. The iter and the fourth ventricle may now be opened up by an incision in the middle line passing between the corpora quadrigemina and dividing the middle lobe of the cerebellum.

In the interior of the substance of the cerebral hemispheres the most important structures are the *basal ganglia* and the *internal capsule*. These structures may be examined in various ways. The simplest method is to separate the hemispheres from the crura by cutting through the latter, and then to separate the hemispheres from each other and lay each of the latter on its outer aspect and make a series of cuts from the inner surface outwards, stopping short of the pia mater, so that should any lesion be found its relation to the cortex can be ascertained by folding the parts together again.

The *pons*, *cerebellum*, and *medulla* may be opened by a series of transverse cuts made from the dorsal aspect, so as to leave the pia mater intact on the under aspect, so that any lesion found may be localisable by replacing the parts.

in their natural position. The dura mater should be stripped from the base of the skull to search for fractures. The *middle ear* can be examined roughly by chiselling away the thin roofs of the tympanum and antrum. A more satisfactory examination is made by removing a temporal bone and making with the saw a horizontal section which should pass along the upper edge of the zygoma and through the upper parts of the external and internal meatus.

The *nasal fossæ* can be roughly examined by removing with the chisel and saw the cribriform plate and the lateral masses of the ethmoid. The *antrum of Highmore* can be examined for pus, growth &c. by making an opening in the canine fossa after the upper lip has been drawn up and the mucous membrane incised.

The *spinal cord*¹ is best removed in the old-fashioned way from behind after making a deep incision in the middle line, and freeing the soft part from the bones by a series of longitudinal cuts made close to the bones.

¹ Artificial injuries to the cord are best avoided by care in removal. It should not be bent or twisted.

Then, with the saw and chisel, the laminae are divided just internal to the articular processes, and with the aid of the bone forceps the laminae are removed; by beginning below they may be raised in a continuous roll held together by the ligaments. The nerve-roots are divided, as far externally as possible, as the cord is being lifted up in the dura mater. The latter, after removal, is cut open in the middle line in front and behind, and after the membranes have been inspected the cord is cut transversely at intervals of about half an inch, and any morbid changes are observed.

The *Intestines*, which have been washed out, are now opened from the jejunum to the end of the sigmoid flexure by cutting along the mesenteric attachment with blunt-pointed scissors.¹ The vermiform process is also laid open. Any morbid changes are noted.

Other Observations.—The metatarso-phalangeal joint of one of the great toes should be opened to look for a deposit of urate of soda. Several joints may be opened where pyæmia or osteo-arthritis &c. may have been present.

¹ The special bowel-scissors with a catch to prevent the gut from slipping away from them save much time.

The *eyeballs* may be examined after removing the roofs of the orbits by the chisel, cutting through the muscular attachments and the optic nerve, and dividing the globe into two halves by cutting with a sharp scalpel in the transverse meridian. The posterior half of the globe can then be removed, and the condition of the optic disc and the retina ascertained.¹

In cases where there is an appearance of a blue line in the gum, a portion of the latter may be removed for microscopical and micro-chemical examination. It should be remembered that when iron has been taken before death sulphide of iron may collect between the edge of the gum and the teeth, giving rise to an appearance which simulates the blue line of lead-poisoning. In the latter condition the deposit of black lead sulphide is in the connective tissue of the gum, and not on the surface.

Bones. — For determining the age, the epiphyses give valuable information. In conditions such as septic osteomyelitis, tubercle, rickets, syphilis, and many others, it is

¹ This is best done by placing the fundus of the eye in water.

important to examine and make sections of some of the bones. In a few cases mothers have been charged with maltreating their children and breaking their bones, when the condition has been the rare disease *fragilitas ossium*, or, as some prefer to call it, *osteopsathyrosis*.

Mammæ.—In women these glands should be examined for milk by squeezing them towards the nipple, and by incising them: the lactating breast is pink and fleshy; the resting breast tough and white.

Post-mortems made in Private Houses.—The foregoing directions apply to examinations of the dead body when made in fairly well equipped mortuaries. For the purpose of establishing a clinical diagnosis, of insuring the validity of a claim to a life insurance,¹ to satisfy the Board of the Cremation Society, or for other reasons, post-mortems are not infrequently conducted within limita-

¹ In one such case examined by the author there was a suspicion that the deceased had poisoned himself by laudanum in the course of an illness. The post-mortem revealed the fact that both lungs were in a state of grey hepatitis in the lower two-thirds of their extent—a condition incompatible with recovery.

tions that the surroundings of the bedchamber entail. The dissection of the body is in the main the same as has been given above, but there are a few points by the observance of which the trial to the feelings of the friends of the deceased, and the difficulties encountered by the medical man, can be greatly diminished.

In the first place, it is a great advantage to have the aid of a skilled assistant. If possible, a strong, high table should be placed in a good light, and, after the table has been covered by newspapers, spread out, the body, from which all garments have been removed, should be lifted on the table. If there is no alternative, the body may be examined on a bed, newspapers being placed under the body to catch any drop of blood that may fall beside it. There should be at hand two slop-pails, an ewer of water, and two wash-basins, soap, and towels. A perfectly satisfactory examination can often be made without removing a single organ from the body, and without making a stain of blood outside the body. It is important to soak up with the sponge the blood that escapes when the heart is opened. A pail being held close to the

body, the sponge is squeezed into it repeatedly until all the blood is removed from the heart and pericardium. The final incisions for opening the heart and examining the valves can be made without removing it from the body. Similarly, the pleuræ can be examined, the lungs and the bronchial glands incised without removing them. An opening large enough to admit a good-sized spoon can be made in the anterior wall of the stomach, and the contents so removed to a jar for examination before the stomach is completely opened by extending the first incision. The kidneys, spleen, liver, uterus &c. can all be incised *in situ*. Or, if it seems better to remove the pelvic viscera, this can be done by cutting through the upper part of the rectum between two ligatures, then holding the upper part of the rectum and bladder in the left hand, freeing the viscera from the pelvic wall by strokes of the knife, and finally dividing them as low as possible without injuring the skin of the perineum. In lieu of weights, measurements (*e.g.* spleen 4 inches, heart twice the size of the fist, &c.) may be given. When the blood has been removed from the heart there is but

little escapes from the brain on its being removed for examination. The intestines give the most trouble. Much can be learned by inspecting their serous coverings: thus, congested patches at the free border of the ileum, or lymph-covered injected surfaces, or perforations may be found in typhoid. In tubercular ulceration tubercles are visible through the serous coat; a cancerous stricture can also be detected by examination of the bowel *in situ*. When any such conditions are found, a portion of the bowel can be opened without removing it from the body. If it is advisable to examine the whole of the intestine, it can be removed in the ordinary way, emptied of its contents, and placed in a pail of water; then each section as it is opened can be washed, and examined. It is well to have some fresh sawdust at hand, so that before the body is sewn up the viscera can be covered with sawdust, which will absorb any fluid that may be present and might escape when the body is being moved after the autopsy.

Record of a Post-mortem Examination.—

In important cases it is advisable to have notes of the autopsy taken down from dictation at

the time, each section being read over after it is written. It is often convenient to have a form for recording the observations. The one on the next two pages, suggested by the author, has been recommended by the Coroner for Central London (Dr. Danford Thomas). The heading to the left of the sheet suggests the steps of the examination in an ordinary case ; but it is not to be supposed that a written note must be made after each item. After the external examination, it is usually only necessary to record the abnormal or pathological conditions present, and to add, 'The other organs were examined and found normal.' A table of average weights &c. is useful for reference.

Average weight and size of normal organs in adults.

Brain.—Male, 49 oz., female, 44 oz., or $\frac{1}{40}$ body weight.

Lungs.—Right, male, 24 oz., female, 17 oz.; left, male, 21 oz., female, 15 oz. $\frac{1}{37}$ body weight in males, $\frac{1}{43}$ body weight in females.

Heart.—Size of the closed fist of the individual; male, 10–12 oz.; female, 8–10 oz., tricuspid orifice admits three fingers abreast and has a circumference of $3\frac{1}{2}$ –4 inches.

The aortic orifice has a circumference of $2\frac{2}{3}$ inches.

Pulmonary orifice has a circumference of $2\frac{7}{8}$ inches.

Mitral orifice admits the tips of three fingers, circumference $3\frac{1}{2}$ – $3\frac{3}{4}$ inches.

NOTES OF THE POST-MORTEM EXAMINATION OF

Name _____ at _____
 age _____ sex _____ external temperature _____
 date _____ body temperature _____

CHIEF POINTS IN THE HISTORY OF THE CASE.

External Examination.

Length and weight of body
 How nourished
 Peculiarities of hair, teeth, scars, &c.
 Rigor mortis, hypostasis, decomposition
 Marks of external violence

Internal Examination.

Height of diaphragm
 Pericardium
 Heart; size, weight
 Right auricle, tricuspid orifice, and valve
 Right ventricle, pulmonary " "
 Left auricle, mitral " "
 Left ventricle, aortic " "
 Heart muscle
 Aorta, coronary arteries, and large blood-vessels

Mouth, tongue, œsophagus . . . . .	. . . . .
Larynx, trachea, bronchi . . . . .	. . . . .
Thyroid and thymus . . . . .	. . . . .
Pleurae right and left . . . . .	. . . . .
Lungs right and left . . . . .	. . . . .
<hr/>	
Peritoneum, &c. . . . .	. . . . .
Stomach and contents . . . . .	. . . . .
Intestine and mesenteric glands . . . . .	. . . . .
Liver (surface, section, weight), gall bladder	. . . . .
Spleen . . . . .	. . . . .
Kidneys and ureters . . . . .	. . . . .
Bladder . . . . .	. . . . .
Urine . . . . .	. . . . .
Suprarenal bodies . . . . .	. . . . .
Generative organs . . . . .	. . . . .
<hr/>	
Meninges and blood-vessels . . . . .	. . . . .
Brain (hemispheres, ventricles, basal ganglia) .	. . . . .
Crura, pons, cerebellum, and medulla . . . . .	. . . . .
Spinal cord . . . . .	. . . . .
<hr/>	
Conclusions and cause of death . . . . .	. . . . .

Signed.....

Date and address.....

Liver.—Male, 60 oz., female, 50 oz.

Kidney.—Male, 4–6 oz., female, 4–5½ oz.

Spleen.—Average weight, 7 oz.

Cases of Poisoning.—In many cases the anatomical changes are so characteristic that the right conclusion is readily arrived at. This is especially the case in poisoning by corrosives like the mineral acids, caustic alkalies, carbolic or oxalic acid, &c. Some of the irritant poisons, such as arsenic in large doses, effect marked changes in the stomach, but in every case the chemical tests should be applied before a conclusion is arrived at. Familiar poisonous berries, leaves, or roots should be sought for in the stomachs of children who have died with symptoms of poisoning. The smell of prussic acid, carbolic acid, chloroform, alcohol &c. will readily be recognised on opening the cavities of the body. Similarly, when a person has died from the effects of swallowing a liniment,¹ the smell will often aid in detecting the poison.

On the other hand, the recognition of the

¹ In a case of poisoning by succus conii investigated by Pepper (*Lancet* 1885), the mousy odour was not perceived until some of the contents of the stomach were heated with potash.

presence of morphia and other alkaloids often demands a degree of toxicological knowledge which only a few experts possess, and a practitioner summoned in the usual way by a coroner to make a post-mortem, and if necessary make an analysis of the contents of the stomach, is often in doubt as to the course he should pursue. Cases of suspected crime are provided for by the authorities of the Home Office, who appoint experts to investigate obscure cases. If the post-mortem is made by a medical man in the usual way, the stomach, previously ligatured at both ends, is removed, and one end is placed within the mouth of a clean glass jar and the ligature is divided, allowing the contents of the stomach to enter the jar without contamination. The stomach is then placed on a clean plate, opened, and its interior inspected; this done, it is placed in the jar along with its contents. A small portion of the latter may be removed, and placed in a small stoppered bottle; the larger jar should then be sealed down, and kept locked up in a cool place. The smaller quantity may be examined by the witness, who should inform the coroner at the inquest or earlier that he has

examined the contents of the stomach to the best of his ability, and leave it to the coroner to decide whether he will call special expert evidence. In some cases, such as chronic arsenical poisoning, it is necessary to secure for examination the intestines and their contents, the kidneys, liver and spleen, as much of the blood as can be obtained, the urine and the bile, in addition to the stomach.

It is important to note the presence or absence of solid faeces in the large intestine. The effects of irritant poisons vary in degree from hyperæmia to ulceration, or even, in the case of a strong mineral acid, to perforation of the bowel. Hypostasis of dependent loops of the bowel is common, and must be distinguished from the diffuse or patchy inflammatory redness due to, say, arsenic or cyanide of potassium, which is most marked in the stomach. Ulceration may be seen where solid particles of phosphorus or arsenic have become adherent to the mucous membrane of the stomach. Yellow sulphide of arsenic may be sometimes seen in the stomach.

A person may apparently recover from the

immediate effect of a poison,¹ and perish subsequently from inanition resulting from the destruction of the gastric mucous membrane. The latter is not infrequently vomited up entire after poisoning by oxalic acid. Caustic alkalies cause extensive softening of the stomach, resembling post-mortem digestion, from which it is distinguished by the softening of the mucous membrane of the mouth and the inflammatory redness of the stomach.

When suspicion is awakened after the body has been interred, the stomach, liver &c. should be secured; if these have undergone complete decomposition, one of the femora should be taken. If the body and the coffin have undergone decay, a little of the earth next the skeleton should be taken. Of course, no disinfectants should be added to the parts removed.

Cases of Suspected Criminal Abortion.—Post-mortem examinations in cases of suspected criminal abortion are made to obtain evidence on two points—first, Had the deceased

¹ This apparent recovery is especially deceptive in cases of phosphorus poisoning.

been recently delivered? second, Are there present signs of means to procure abortion having been employed? As in all cases a careful and complete examination must be made, but the chief interest of the examination centres in the genital organs. The intestine and its contents should also be examined with especial care, since ergot, and irritants such as savin and colocynth-pulp, are not infrequently employed as abortifacients, or as adjuvants to the local mechanical means employed to produce uterine action.

In the great majority of cases the signs of recent delivery are unmistakable, because, as a rule, abortion is not produced before the third month, when the uterus is considerably enlarged.

The length of the normal unimpregnated uterus is 3 inches or less, the body and cervix each measuring $1\frac{1}{2}$ inch; its weight is about 1 ounce. During pregnancy the measurements increase, chiefly by enlargement of the body. Immediately after delivery at full term the uterus measures 9 inches, or more, and weighs nearly 2 pounds. Before it is removed from the body the fundus lies above the level of the

top of the pubes. When cut open, the cavity is large, and the walls are concave inwards instead of convex, as in the unimpregnated uterus. The interior, especially the placental site, is rough, and the latter is usually studded with clots, which plug the venous spaces. The dead tissues and clots are gradually separated, and after four weeks only some pigmentation remains to mark the placental site, the uterine mucosa having been regenerated. The cervix immediately after delivery is dilated, and the external os lacerated. The vagina is dilated, and there are slight lacerations at the fourchette or elsewhere. In the normal course the parts have returned to their original condition in six weeks. When septic endometritis (puerperal fever) ensues, the interior of the uterus has a sloughy appearance, and frequently there are septic thrombi in the uterine and iliac veins. If abortion takes place within the first four weeks of pregnancy, there is little to be found in the uterus save slight increase in weight, slight dilatation of the cervical canal, and roughness of the interior, all traces of which pass away in a day or two.

The accompanying figure (10) shows a normal uterus about the fourth week of pregnancy. The organ had the same length (3 inches) as in the unimpregnated state, but is somewhat thicker and broader.

Corpora lutea, whether from menstruation or pregnancy, are so variable in size that they are not to be relied on for the diagnosis of pregnancy. As stated above, criminal abortion is seldom attempted before the third month; this is, however, not always the case.¹

In making the post-mortem examination in these cases, before the pelvic viscera are removed, a careful examination of the pelvic peritoneum should be made after, if necessary, sponging away pus and lymph. After removal of the viscera the upper part of the vagina and

¹ In a case investigated by Pepper a Belgian was convicted of manslaughter. He injected into the vagina a strong solution of corrosive sublimate. The specimen is preserved in the museum of St. Mary's Hospital, No. 1410. The uterus contains an ovum of eight weeks. The vagina is lined by a grey slough. The mucous membrane of the rectum shows signs of intense inflammation. The woman died of acute mercurial poisoning from absorption.

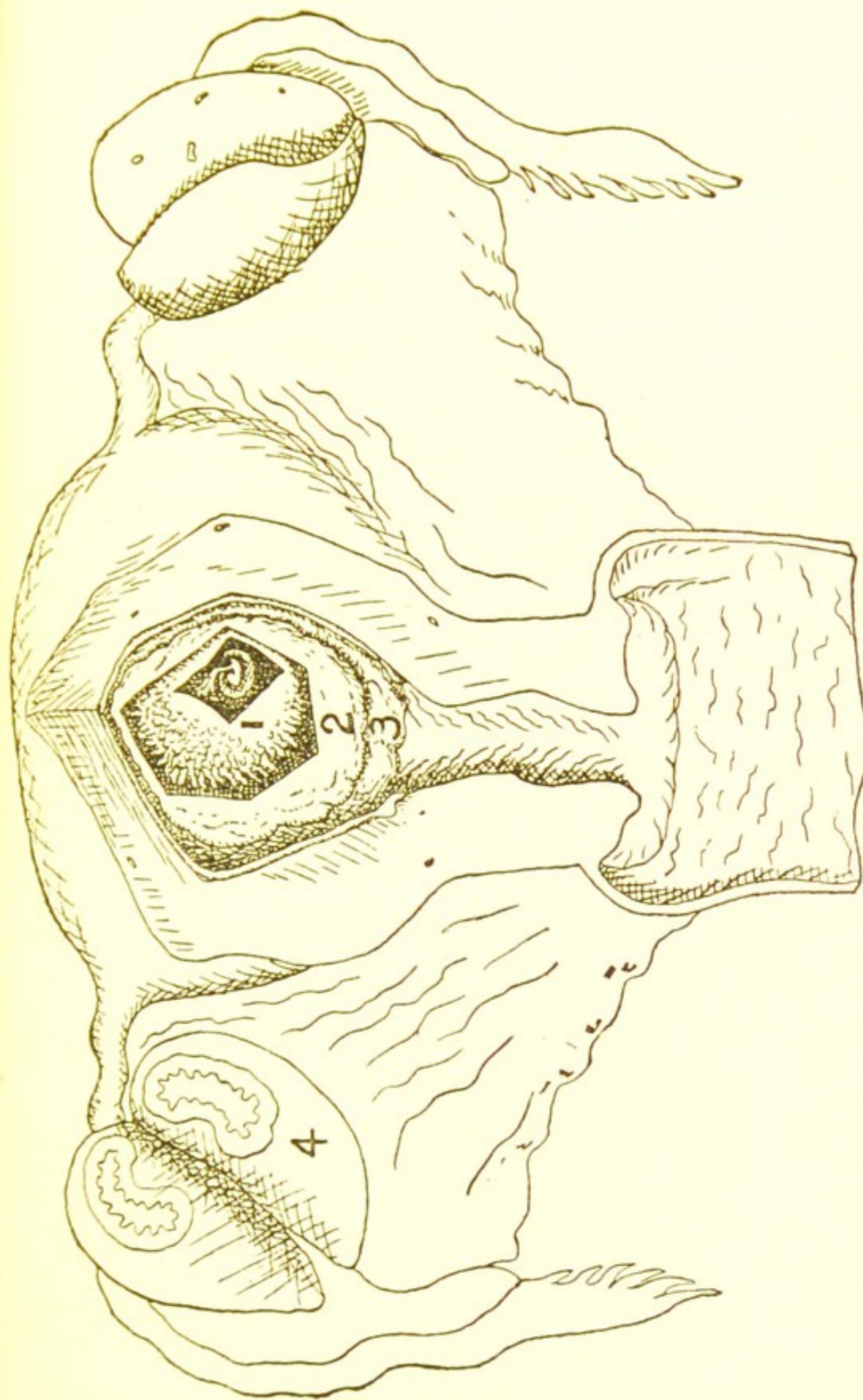


FIG. 10.—An uterus at the fourth week of pregnancy, opened from behind. 1 is on the chorion; 2, decidua reflexa; 3, decidua vera. The chorion has been cut open to show the minute embryo in the amnion which does not yet fill the cavity of the chorion. Part of the decidua reflexa has been removed to show the chorion. 4 is on the left ovary below the large corpus luteum.

the uterus should also be examined for punctures,¹ &c.

Examination of the Bodies of New-born Infants.—The examination of the body of an infant that has been found in circumstances which suggest the possibility of its having been murdered soon after its birth, includes some special observations, made with the view of furnishing evidence in answer to questions as to (1) its maturity, (2) whether it has breathed, (3) whether it was born alive, (4) how long it lived, (5) the cause of death, (6) how long it has been dead.

The external examination must be made carefully. Punctures of the fontanelle or spinal cord (as in the murders by Burke and Hare), evidence of strangulation, injuries such as fractures of the skull, foreign bodies in the pharynx, should be looked for. The state of umbilical cord, whether cut,

¹ Such injuries are almost always inflicted by another person, but that they may be self-inflicted is proved by a case mentioned by A. T. Bristow (Hamilton and Godkin, vol. i. p. 49). A married woman who had previously procured abortion on herself by means of an umbrella-wire, at last caused her own death by perforating the uterus in repeating the operation.

torn, or tied, should be recorded; also the temperature of the body, rigor mortis, and signs of putrefaction. Notes should be made of articles of clothing &c. in which the body is enveloped.

In the course of the examination, which in its general order is the same as that pursued in other cases, the six points must be kept in mind. The degree of maturity may be ascertained by the data given in the table on p. 64. A child may breathe before it is born, *i.e.* before the whole of its body is extruded from the maternal organism. If the child has fully breathed, the *volume* of the lungs is such that they are readily seen on opening the thorax; the lungs contain air within the vesicles, and so are mottled and of a lighter colour than the brownish colour they have before respiration has taken place. It must be remembered that artificial inflation may produce aeration of the lungs similar to that caused by natural respiration. The degree of aeration may be estimated by placing the two lungs removed from the body, together with the bifurcation of the trachea, in water, and subsequently dividing each lung into twelve parts

and testing each part separately by placing it in water before and after it has been firmly compressed in the hand. The lungs may float not from vesicular aeration but from gases of decomposition. The latter may be distinguished by the large and unequal size of the gas bubbles, and by their being readily displaced from one part of the lung to another.

If the child dies immediately after birth it is difficult to prove that it was born alive. In cases where the child has lived for some days the state of the *umbilical cord* may afford valuable evidence. If it has undergone partial or complete natural separation the child must have lived. The presence of air in the tympanum, or in the stomach and intestines, or of food in the stomach, and signs of desquamation of the skin, should also be looked for. Many new-born infants die from natural or accidental causes, such as malformations of the heart or of the alimentary tract, pneumonia, apoplexy, non-expansion of the lungs, or from the accidents of prolonged or precipitate labour. Immature infants are more likely to perish; it is extremely rare for a child born before the seventh month of gestation to survive, and

therefore it is only of practical importance to consider the foetal development of the last four months of pregnancy. The following table (p. 64) will suggest the chief points to be looked for. The processes by which the foramen ovale, the ductus arteriosus, and the ductus venosus are closed, do not commence for several days after birth.

TABLE OF DEVELOPMENTAL CHANGES IN THE FÆTUS

Period	Average length	Average weight	Nails	Other features
At end of sixth month . . .	9-13 inches	1-2 lbs.	forming	Skin thin and covered with lanugo, eyelids adherent, pupillary membrane present, no subcutaneous fat, ossification in manubrium and os calcis.
At end of seventh month . . .	12-15 inches	2-4 lbs.	not reached ends of fingers	Hair forming on head, subcutaneous fat forming, eyelids open, ossification in first piece of body of sternum and in astragalus.
At end of eighth month . . .	15-17 inches	4-5 lbs.	reached ends of fingers	Pupillary membrane disappeared, lanugo disappearing. Testes in inguinal canals, ossification in second piece of sternum.
At end of ninth month . . .	18-20 inches	5-8 lbs.	project beyond fingers	Subcutaneous fat abundant, ossification in lower epiphysis of femur, testes in scrotum.

Starvation.—Cases in which starvation from criminal neglect is suspected usually concern young children or imbeciles. The same effects may be produced by stricture of the œsophagus, chronic diarrhœa or dysentery, tumours of the brain, disease of the mesenteric glands, &c.

The absence of subcutaneous fat, atrophy of the stomach, intestine, pancreas, and soft structures generally, with a rough, dry condition of the skin, are the chief features.

Tables of normal heights and weights at different ages are to be distrusted, since individual variation is so wide. They should always be carefully checked by pathological investigation. Since questions are sometimes asked in court respecting the weight and height, the following table, which has been adopted by the National Society for the Prevention of Cruelty to Children, may be of service :

STANDARD WEIGHTS FOR UNDER ONE YEAR.

The figures in these tables are in lbs. and ozs.

At birth	6-8	4 months old	10-8	8 months old	14-4
1 month old	7-4	5 "	11-8	9 "	15-8
2 months "	8-4	6 "	12-4	10 "	16-8
3 " "	9-6	7 "	13-4	11 "	17-8

STANDARD WEIGHTS AND HEIGHTS FOR ONE YEAR AND OVER.

AGE IN YEARS.	MALES.		FEMALES.	
	Weight lbs. ozs.	Height in inches.	Weight lbs. ozs.	Height in inches.
1 year old	19-13	27-5½	18-13	27-0
2 years old	24- 3	31-0	24- 3	30-7½
3 "	27- 8	34-2½	27- 3	33-6½
4 "	30-13	36-6½	30- 8	35-9½
5 "	34-14	38-8½	33- 9	38-5½
6 "	39- 1	41-2½	36-11	40-7½
7 "	43- 5	43-4½	39- 1	42-9½
8 "	47- 8	45-7½	41-13	45-5½
9 "	51-11	48-1½	46- 3	47-4½
10 "	55- 6	50-4½	50-13	49-2½
11 "	59- 6	52-5½	56- 1	50-6½
12 "	63-13	54-5½	63-13	52-7½
13 "	72-13	56-4½	71- 8	55-8½
14 "	81- 9	58-6½	79-13	58-1½
15 "	90- 9	61-0	88- 0	58-9½
16 "	99-13	63-0	95-11	59-8½

N.B.—The above scale is taken from Woodman and Tidy's 'Forensic Medicine and Toxicology,' 1877.

Wounds and Contusions should be carefully described. Among the many questions which present themselves regarding wounds on a body are: Was the wound inflicted during

life? Was it homicidal, suicidal, or accidental? A dead body lying in a road may be injured by vehicles, or if lying in a canal may be scraped by passing barges. If the lesions are in the form of contusions, swelling and extravasation of blood will prove that the injury was inflicted during life. In the same way copious internal or external hæmorrhage will prove that a wound was inflicted during life, though a certain amount of blood may escape from the veins when injuries are inflicted immediately after death. The position of the body, foot-marks, finger-prints, the state of the dress, and other points are to be noted. Suicidal wounds of the throat in right-handed persons are made from left to right, to which side they slope downwards, becoming shallower. Multiplicity of wounds is not necessarily an argument in favour of homicide. In a case of suicide examined by the author there were several deep cuts in the neck, and on the arms and forearms of both sides were very numerous deep cuts, dividing muscles, nerves, and arteries, so that it was difficult to realise how there had been sufficient power in the left arm for the knife to be held with

a firm grasp to inflict the injuries on the right arm. Cuts on the hands and in the back are commoner in homicide than suicide. In gunshot wounds presence or absence of powder-marks on the skin and the path of the projectile in the body are to be noted. It must not be forgotten that when pyæmia, tetanus &c. cause a wound to prove fatal, the wound is counted as the primary cause of death.

Mutilated Remains.—The parts should be measured and accurately described, with the view of establishing the following, among other points, whether they are human, what part of the body do they represent, the age, sex, and probable height of the individual to whom they belonged, and how were they removed from the rest of the body, and whether this was done before or after death? Limbs from the dissecting-room contain arsenic or other injection. Parts amputated by the surgeon show the classical incisions. Extravasation of blood and ecchymoses point to removal during life.

The average time required for making a post-mortem is one hour. The body is stitched up by a continuous suture, which begins below. Each stitch is made from the deep surface.

SOME OF THE LEGAL ASPECTS OF POST-MORTEM EXAMINATIONS

In England the primary court of inquiry into cases of violent or suspicious death is constituted by a Coroner and jury. With the exception of one State, it is the same in the United States of America. In Scotland a State official, the Procurator Fiscal, replaces the Coroner and jury. In Germany, the police, aided by medical experts appointed by the State, and in France an Attorney of the Republic, with one or more medical assessors, conduct the inquiry. In this country the Coroner has power to summon medical witnesses, and to direct the performance of post-mortem examinations; and since this section of the law closely affects practitioners, it will be of advantage to reproduce the sections of the 'Coroner's Act' of 1877 which concern medical witnesses and post-mortem examinations:

Sect. 21.—(1) Where it appears to the Coroner that the deceased was attended at his death, or during his last illness, by any legally

qualified medical practitioner, the Coroner may summon such practitioner as a witness ; but if it appears to the Coroner that the deceased person was not attended at his death by any legally qualified medical practitioner, the Coroner may summon any legally qualified medical practitioner who is at the time in actual practice in or near the place where the death happened ; and any such medical witness as is summoned in pursuance of this section may be asked to give evidence as to how, in his opinion, the deceased came to his death.

(2) The Coroner may, either in his summons for the attendance of such medical witness, or at any time between the issuing of that summons and the end of the inquest, direct such medical witness to make a post-mortem examination of the body of the deceased, with or without an analysis of the contents of the stomach and intestines ;

Provided that where a person states upon oath before the Coroner that in his belief the death of the deceased was caused partly or entirely by the improper or negligent treatment of a medical practitioner or other person, such medical practitioner or other person shall not

be allowed to perform or assist at the post-mortem examination of the deceased.

(3) If a majority of the jury sitting at an inquest are of opinion that the cause of death has not been satisfactorily explained by the evidence of the medical practitioner or other witnesses brought before them, they may require the Coroner in writing to summon as a witness some other legally qualified medical practitioner named by them; and, further, to direct a post-mortem examination of the deceased, with or without an analysis of the contents of the stomach or intestines, to be made by such last-mentioned practitioner; and that whether such examination has been previously made or not; and the Coroner shall comply with such requisition, and in default shall be guilty of a misdemeanour.

Sect. 22.—A legally qualified medical practitioner, who has attended at a Coroner's inquest in obedience to a summons of the Coroner, under this Act shall be entitled to receive such remuneration as follows; that is to say:

(a) For attending to give evidence at any inquest whereat no post-mortem examination

has been made by such practitioner, one guinea; and

(b) For making a post-mortem examination of the body of the deceased, with or without an analysis of the contents of the stomach or intestines, and for attending to give evidence thereon, two guineas;

Provided that—

(1) Any fee or remuneration shall not be paid to a medical practitioner for the performance of a post-mortem examination instituted without the previous direction of the Coroner.

(2) Where an inquest is held on the body of a person who has died in a county or other lunatic asylum, or in a public hospital, infirmary, or other medical institution, or in a building or place belonging thereto, or used for the reception of the patients thereof, whether the same be supported by endowments or by voluntary subscriptions, the medical officer, whose duty it may have been to attend the deceased person as a medical officer of such institution as aforesaid, shall not be entitled to such fee or remuneration.

Sect. 23. Where a medical practitioner fails

to obey a summons of a Coroner issued in pursuance of this Act, he shall, unless he shows a good and sufficient cause for not having obeyed the same, be liable, on summary conviction on the prosecution of the Coroner or of any two of the jury, to a fine not exceeding five pounds.

Sect. 24.—Where a place has been provided by a sanitary authority or nuisance authority for the reception of dead bodies during the time required to conduct a post-mortem examination, the Coroner may order the removal of a dead body to and from such place for carrying out such examination, and the cost of such removal shall be deemed to be part of the expenses incurred in and about the holding of an inquest.

ON GRANTING CERTIFICATES OF DEATH ¹

When the medical man in attendance during the last illness of a person is able to state the cause of death, he is bound under a penalty of

¹ In writing this section the author was greatly indebted to the useful pamphlet by A. Braxton Hicks entitled, 'Hints to Medical Practitioners concerning the Granting of Certificates of Death.'

forty shillings to give a certificate. The form of the death certificate was fixed by an Act of Parliament, and requires the medical man to give information as to the 'primary' and 'secondary' causes of death. By the primary is meant the cause that led up to the secondary or more immediate cause. A few examples will make clear the meaning of the terms :

Primary	Secondary
Bright's disease	Cerebral hæmorrhage
Typhoid fever	Peritonitis
Measles	Bronchopneumonia
Mitral stenosis	Bronchitis
Thrombosis of veins of the leg	Pulmonary embolism

In the last case death may be sudden, and yet be perfectly natural, so that there would be no difficulty in granting a certificate.

The certificate is also meant to afford information as to the *duration of the disease*. Caution is to be observed in filling up this item. The statement should be made from the personal knowledge of the certifier. For instance, in districts where child insurance is rife, the parents may have strong reasons for wishing to mislead the medical man as to the duration of symptoms, and for concealing some

injury the child may have received owing to their neglect. The duration of the disease should be returned as 'unknown' when such is the case. Similarly, when the primary cause of death is unknown, it is best to say so. Suppose the death of a young woman is certified as due to 'peritonitis' without any primary cause being given: such a certificate might give rise to the suspicion that the writer wished to conceal a case of criminal abortion. In two classes of cases the certificate should be withheld. These are:

- (1) Where the cause of death is unknown.
- (2) Where the cause of death is known to be unnatural, *e.g.* from violence.

As an instance of the first class a case may be taken in which the doctor who had not previously attended the case arrived after the patient's death. Here the best course to pursue is to direct the friends of the deceased to give notice to the Coroner. Similarly in the case of stillborn children, unless the practitioner is present at birth, it is best to withhold the certificate. Midwives' certificates should not be received. The same course is the proper one when the medical man has only seen the

patient once or twice, and circumstances point to the possibility of there having been criminal neglect on the part of those in charge of the patient.

In the last class of cases it is sometimes easy enough to make out a certificate, but in the interest of the friends it may be inadvisable. Take a case of fatal tetanus following upon a purely accidental injury. In such a case the certificate might read :

Primary cause	Crushed finger
Secondary	Tetanus

The registrar of deaths is obliged to refer such a certificate to the Coroner, and the Coroner is bound to hold an inquest, and thus there is unnecessary delay. The necessity for an inquest arises out of the fact that neither the medical man, nor the Coroner, but only a jury can decide whether the injury was accidental or felonious.

There is a widespread but erroneous impression that when death results from the effects of an injury received more than a year and a day previously there is no call for an inquest. This opinion arises from the fact that in criminal law no person can be convicted of

causing the death of another if such death occurs longer than a year and a day after the receipt of the injury. Civil suits, however, such as insurance claims, may be raised on the case, and hence the necessity of an inquest.

Whenever the medical man is suspicious of foul play, such as infanticide, criminal abortion, poisoning, &c., no certificate should be given. Frequently, medical men, to save the possibility of unjust suspicions being cast on the friends of the deceased, make a post-mortem on their own responsibility. Such a course is liable to entail trouble, and a second autopsy ordered by the Coroner may reveal something overlooked by the medical practitioner who first examined the body.

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