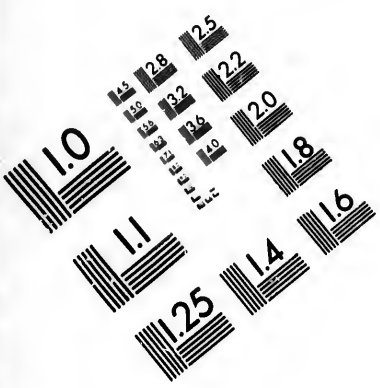

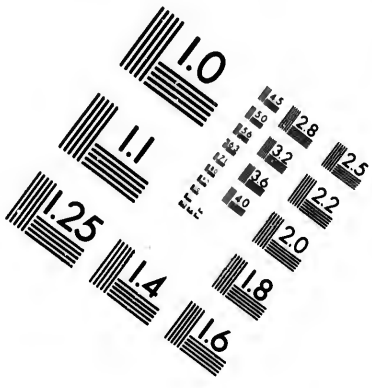

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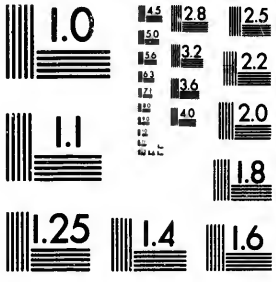

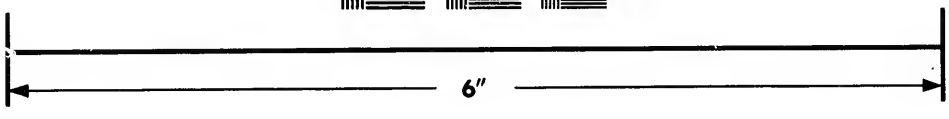

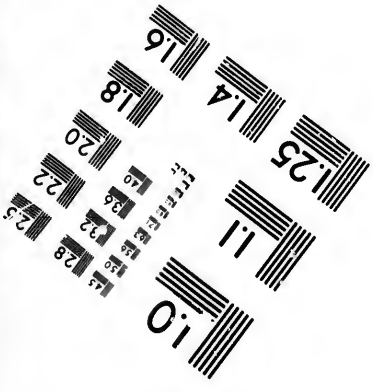

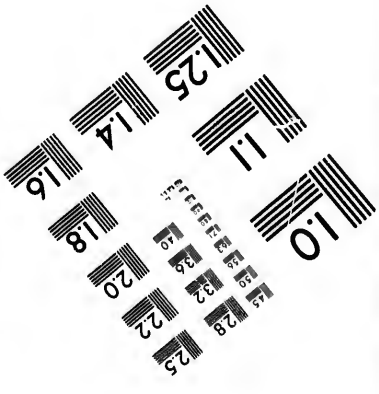

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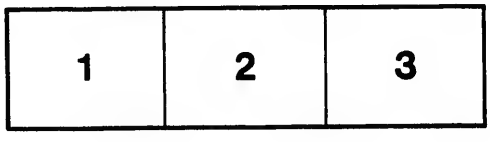

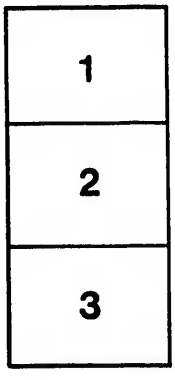

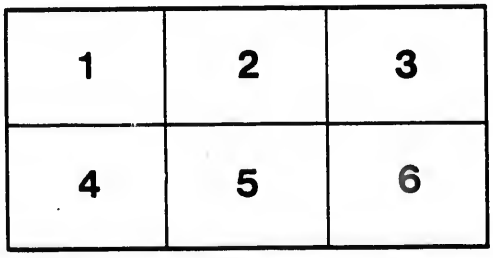

SYLLABUS

OF

POST MORTEM METHODS

FOR THE USE OF

STUDENTS

IN THE

MONTREAL GENERAL HOSPITAL

BY

WYATT JOHNSTON, M.D.

Pathologist to the Hospital.

C. ASHFORD,
MONTREAL.
1890.

All medical students should leave college prepared to perform an autopsy properly. This is especially necessary in a country where, as yet, there exists no class of trained medico-legal specialists, and where the youngest practitioner in the district is usually the one called upon to perform autopsies for the coroner.

The best way for a student to learn to recognize pathological changes in organs is by carefully studying normal organs whenever opportunity offers.

By studying up the methods thoroughly before entering the post-mortem room, students would derive far greater advantage from the opportunities given them there. Comparatively few students learn to dissect the brain and heart properly, though the brains and hearts of animals can be bought at any butcher's stall, and serve very well for practising the methods. The method given here for the heart, though not a neat one, is so simple as to require absolutely no technical skill in carrying it out. It is the one followed in the Munich Pathological Institute.

The rest of the technique seems to be regarded as common property in all text books. The diagrams were drawn by Mr. A. Holdstock.

DIRECTIONS

FOR

PERFORMING POST MORTEMS.

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1. **By following a good method in making post-mortems** every organ can be examined in its turn without interfering with the examination of the remaining organs; the body is not disfigured and the autopsy is completed in a reasonably short time. This ensures much better results than when the examination is conducted in a haphasard way, governed only by the special clinical features the case may have presented. The method introduced by Virchow is readily learned, and no great technical skill is required to carry it out. The one here described differs from it only in unimportant details.

It will be seen that the autopsy begins with a careful external examination of the body. Next the brain is examined, though there is no serious objection in most cases to doing this later on if preferred. Then comes the opening and inspection of the abdomen, followed by the opening, inspection and dissection of the thorax; lastly, the dissection of the abdomen. The reason for making a preliminary inspection of

the great serous cavities as soon as they are opened, is that their condition is liable to be altered from exposure to the air, entrance of blood, etc. Any detailed examination of the extremities had better be deferred till the end of the autopsy. We examine in sequence the different organs composing each system, the examination of the urinary organs being finished before that of the digestive organs is commenced, and so on.

Virchow's method is remarkably well suited for medico-legal cases, though certain special precautions, mentioned later on, have then to be observed. Otherwise it will be found but seldom necessary to depart materially from the routine here laid down. The chief cases in which it is necessary to modify the procedure, are those in which the anatomical relations of the parts are much altered, or where the organs are matted together. In such cases it is best to examine first such organs as are readily got at, remove the more involved portions *en masse* and dissect them outside the body in the order found most convenient.

2. **Instruments.** A distinguished American pathologist, who makes upwards of one thousand autopsies yearly, found it convenient to limit his outfit to a "vest pocket" post mortem case, containing merely a knife, a small saw and a needle. While in the hands of skilful persons much can be done with very few tools, beginners will do well to provide themselves with one of the well-filled cases sold by instrument makers. These should contain a couple of large "post-mortem" knives, two or three dissecting scalpels, dissecting forceps, probe-pointed scissors, intestine scissors, saw (with removable back), chisel, mallet, (a very convenient form is that provided with a hook at the end of the handle for wrenching off the skull-

cap) bone forceps, and probe, as well as needle and thread for sewing up. For ordinary purposes no special brain-knife is required.

In addition to these a measuring rule, weights and graduated glasses are indispensable where scientific accuracy is aimed at. Some watery solution of iodine (1%) in iodide of potassium is needed to test for amyloid degeneration. Plenty of water, a sponge and some towels are essensial to cleanliness.

A microscope with the usual accessories is necessary for the proper investigation of many cases, and it should be borne in mind that a very simple microscopic examination of the fresh material, made at the time of the autopsy, may often yield more valuable information than can afterwards be obtained by even the most elaborate study of the same material when altered by hardening processes. In hardening portions of tissue, the pieces should not exceed half an inch in thickness, and should be placed in twenty times their bulk of the hardening fluid, which is to be renewed several times.

3. **Dissection of body**. Learn from the first to hold the knife properly. Grasp it firmly in the closed fist. Do not hold it with the fingers as in the dissecting room. What is wanted is a rapid survey of the whole body; not a minute dissection. In cutting use the whole length of the blade, not the point alone. Do not press the knife into the tissues, but draw it through them rapidly; this leaves the cut surface smooth. Make the cuts free and sweeping, so as to expose as large a surface as possible. "A free incision, even when made in the wrong place and direction, is preferable to several small cuts correctly made—smooth though wrong incisions are better than jagged ones which are correct." (Virchow).

Always put the tissues on the stretch before cutting, either by pulling the neighbouring parts to one side with the left hand, or in the case of elastic organs, by supporting from below. By attending to these directions, the dissection can be made rapidly, and the parts are exposed in good condition.

During the entire dissection, keep the fingers constantly moist by dipping them frequently in clean water, thus preventing any blood, etc., from drying on them. It will then be but seldom necessary to do anything beyond simply washing the hands at the close of the autopsy in order to free them from all unpleasant odour. In case this cannot be attended to, washing with diluted Condy's fluid, will be found to remove the odour promptly, though numerous other disinfectants answer equally well.

4. **Note taking.** The notes of the autopsy should be dictated at the time. When it is impossible to do this, they should be written out in full immediately afterward. Describe each condition at the time it is observed, and before proceeding with the next step in the autopsy. Describe at length only what is pathological. Notes concerning normal conditions should be as brief as possible. It is usually enough to state simply that an organ is normal, but at times it is better to state upon what grounds this opinion has been formed. Make the description entirely objective, stating only what is actually seen, rather than the opinion formed of its nature. At the close of the autopsy draw up a short summary (anatomical diagnosis) of the conditions found. Exclude all accounts of the technique from the report, except where such details are necessary to make the description intelligible. Observe the position and surroundings of each organ before removing it ; the size, external appearances, and any information obtained by

palpation etc., before incising. Note the contents and condition of the wall in hollow organs. Describe with special care the appearance of the cut surface after making an incision. The size, weight consistency, texture, moisture, amount of blood present and occurrence of any abnormal element, are points which are easier to determine than alterations of color, beside being more easily described, and less likely to mislead. Compare everything with the normal and judge it from that standpoint.

5. **An opinion** as to the significance of the changes found, and their relation to one another, cannot be formed until the examination is completed, as some condition found at a late stage may upset any opinion prematurely formed. A positive opinion as to the immediate cause of death is often very difficult to arrive at, indeed quite impossible in a certain proportion of cases, a fact not taken sufficiently into account in legal medicine.

6. **Preparations.** The autopsy should not under ordinary circumstances be performed earlier than 10 to 24 hours after death; the body during this time being kept in a cool place.

Place the body on its back upon the table or board of convenient height, in a well-lighted spot. Autopsies should not be done by artificial light where this can be avoided.

Ascertain if possible the name, age and occupation of the deceased, the clinical history and the symptoms attending death. Note the time which has elapsed since death.

See that everything is in readiness before commencing, and have clearly in mind the special points to be determined by the autopsy.

7. **Inspection of body.** Before beginning the actual dissection of the body, make a careful and thorough external examination. This should on no account be postponed, as it cannot be done satisfactorily after the dissection has once been begun.

If the body is that of an unknown person, note with special care anything which may lead to its subsequent identification.

Note the sex, apparent age, size, development, and anything specially striking in its appearance.

Note the state of nutrition.

Note the signs of death:—rigor mortis, post mortem lividity and any evidences of putrefaction.

Inspect in order the various regions of the body, viz.:—Head, neck, chest, abdomen, back and extremities, examining carefully the natural orifices,—mouth, nose, ears, anus, genitals. Note any indications of present or past disease, and any injury or foreign body. If wounds are present, ascertain their position, extent and condition. In this examination the condition of skin, hair, eyes and teeth, should be noted, but any special disease of the skin is best described separately.

This completes the inspection.

8. **Order in which the organs should be examined.** The brain is usually examined first of all, as otherwise it becomes anaemic through the blood escaping from the veins on opening the heart.

The spinal cord may be examined either at the beginning or the end of the autopsy.

The thorax and abdomen are next to be examined, though in cases where the examination of the brain is omitted, the dissection can be commenced here, in the following order:—(1) Open and inspect the

abdomen. (2) Open and inspect the thorax. (3) Remove and examine the heart, lungs and organs of neck.

Examine the abdominal organs in the following order :

Omentum ; spleen ; left kidney and ureter ; right kidney and ureter ; bladder and urethra ; genitals ; rectum ; small and large intestine ; stomach and oesophagus ; duodenum, bile ducts, portal vein, gall bladder and liver ; pancreas ; supra renals, coeliac ganglia, mesentery, retro-peritoneal glands, vena cava, aorta, thoracic duct, etc.

Last of all, if necessary examine the extremities, bones, joints, peripheral vessels and nerves.

9. **Opening the head cavity.** Place a block of wood under the head to support it, and make an incision commencing close behind one ear, passing directly over the vertex (top of the head) and ending close behind the other ear, cutting down to the bone all the way. If the hair is long it must first be parted in the line of the incision, and tied up out of the way.

Next reflect the two halves of the scalp forward and backward with a knife or chisel, till the orbital ridges and the occipital protuberance are exposed, taking care to keep the point of the instrument directed against the bone so as not to injure the scalp. Tuck the hair under the folds of the scalp to keep it from being soiled. Note carefully the condition of scalp and skull cap.

Draw a line with the knife around the skull where the bone is to be sawn through, cutting the temporal muscles. This line should pass just above the frontal eminences in front and through the occipital protuberance behind. Instead of a single circular cut it is better to saw in two planes, shewn as the dotted lines F T and O T in figure 1, intersecting at the mastoid

region on each side. The skull-cap is then easier to retain in position when the body is sewn up.

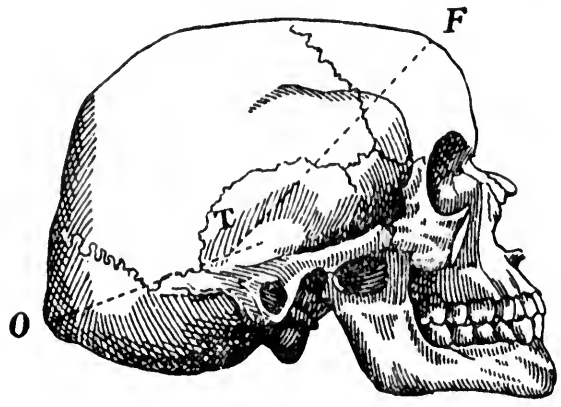


Fig. 1.—Diagram to illustrate the method of removing the skull-cap. The bone is first sawn through in the plane F T and afterwards in the plane O T.

In sawing, steady the head with the left hand, which should be protected with a towel in case the saw should slip. In most cases it is sufficient to saw through the outer table only and crack the inner by a few taps with a mallet and chisel at different spots; but in cases where fracture of the skull is suspected, both tables must be sawn completely through, even at the risk of wounding the brain, lest a fracture be artificially produced. Test the depth of the cut from time to time with the point of the saw, remembering that the bone is much thinner in the temporal region than elsewhere. As the thickness of the skull may vary from nearly half an inch down almost to that of stout writing paper, it is often impossible to avoid injuring the brain to some extent but as the sensation imparted to the hand becomes quite different as soon as the bone is completely cut through, the mishap should be recognised at once.

Wrench off the skull cap with the chisel or with a hook made specially for the purpose. Where the dura is very firmly attached to inner surface of the bone, it may either be removed together with the skull-cap after dividing the falx, or else the brain itself may be completely removed with the skull-cap, a more difficult method Examine the calvarium. Examine the external surface of the dura. Slit open and examine the longitudinal sinus.

Divide the dura along the line of the saw cut on one side, draw it gently over to the opposite side and examine its inner suface and corresponding surface of the brain. Do the same on the other side. Pass a scalpel carefully between the hemispheres and cut the falx anteriorly, reflect the dura backward, and examine the pia and brain along the convexity, carefully comparing the two sides.

The nature and amount of any fluid which may have escaped should be noticed.

10. **To remove the brain,** tilt the head back and raise the frontal lobes. Support the hemispheres with the left hand. Cut the optic nerves with a sharp knife at their points of exit. Pass the knife round the pituitary fossa, separating the pituitary body. Divide both internal carotid arteries. Cut the third nerves at their points of exit. Next pass the knife along the sharp posterior border of the petrous bone, dividing the tentorium together with the fourth and fifth nerves, taking care not to wound the cerebellum which lies immediately beneath. Divide the remaining cerebral nerves at their points of exit. Finally pass the knife deeply into the foramen magnum, sever the medulla as far down as possible, cut the vertebral arteries on each side and remove the brain, separating it gently from the dura with the right hand.

11. **Examination of brain.** The method to be followed must depend upon whether it is wished to determine accurately the extent and relations of a lesion in the substance of the brain or simply to see whether any lesion is present at all, being satisfied with a rough idea as to its extent and location.

In the former case the best method consists in making a series of transverse sections through the whole brain at definite levels. This can be done with the fresh brain by using a long-bladed knife (an ordinary carving knife answers very well) but the best results are obtained when the brain has first been hardened in a solution of bichromate of potassium, the same fluid being injected into the arteries so as to reach the deeper parts. This process is very tedious and troublesome, and is only to be recommended when a specially careful investigation is to be made. For ordinary purposes the following method (Virchow's) is preferable:—

12. **Dissection of brain.** Place the brain base upwards and examine the base, noting the state of the pia and vessels.

Turn the brain over and examine the state of the convolutions and fissures, removing the pia if necessary by pinching up a fold between the thumb and forefinger and rolling the brain substance away from it with the remaining fingers.

Next open the roof of the left lateral ventricle by a shallow incision made with the point of the knife dividing the corpus callosum slightly ($\frac{1}{8}''$) to the left of the median raphé, and extended into the anterior and posterior cornua. In making this incision the roof of the ventricle should be raised by drawing the hemisphere gently outward with the left hand, thus avoiding injury to the basal ganglia, which lie immediately beneath.

Now make a deep incision into the white substance of the left hemisphere, curving outward so as to pass just external to the great ganglia, and cutting almost through the cortex all the way. Several similar incisions external to this one, and parallel with it, will expose the whole of the white substance of the left hemisphere.

Make a similar dissection on the right side. (It will be found convenient before doing this to turn the brain end for end).

The lateral ventricles being now fully exposed, note their size, contents,—including any fluid which may have escaped in the process of opening,—and the condition of the ependyma.

Expose the third ventricle by passing the blade of the scalpel into the foramen of Munro and cutting upwards. Reflect the posterior part forward with the handle of the knife, and, after dividing the posterior limb of the fornix on the right side, turn it over to the left, exposing the choroid plexus, corpora quadrigemina and pineal gland.

Next examine the fourth ventricle, exposing it by cutting through the vermiform process of the cerebellum, taking care to lift the left lobe slightly at the same time so as to avoid injuring the floor of the ventricle.

Now examine the basal ganglia by a series of parallel transverse incisions, beginning anteriorly and made about a quarter of an inch apart. In making these incisions the knife should be held lightly between the fingers and thumb and moved like a fiddle bow, the blade being kept constantly wet and the parts put upon the stretch by supporting the temporal lobes from below, as otherwise the delicate brain tissue will be torn. The incisions should penetrate to the cortex, exposing the claustrum and the convolutions of the island of Reil.

A more crude method of examining the ganglia, is by simply making a couple of longitudinal incisions through the corpus striatum and optic thalamus on each side, after opening the lateral ventricles.

A few transverse cuts are now made into the corpora quadrigemina.

Examine the cerebellum by making a series of deep incisions into each of the lateral lobes radiating from the corpora quadrigemina and exposing the substance of the cerebellum and cerebellar peduncles.

Fold the brain together and place it again with the base upwards. Finish the dissection of the arteries at the base and remove them.

Examine the crura cerebri, pons and medulla by a series of parallel transverse incisions.

If the dissection has been properly made, the various parts of the brain will still be connected and the whole organ can still be folded together like a loosely bound book, each part remaining in its normal position, so that when hardened any portion desired can be examined microscopically. The points to be attended to in examining a brain, are: (1)—to preserve the relation of parts in the manner above described, and (2)—by keeping the knife blade constantly wet, to avoid tearing the brain tissue.

13. **Base of skull.** After finishing the examination of the brain, examine the dura at the base of the skull, slitting open the principal sinuses. Remove the dura by seizing the edge with a towel and stripping it off. Examine the bones at the base. By chipping away the sphenoid bone, the course of the carotid artery, cavernous sinus and jugular fossa can be exposed.

14. **Ear.** The internal and middle ear can be examined by simply breaking open the petrous bone

in the region of the semicircular canals with the hammer or chisel, and removing the fragments with forceps. This affords an excellent view of the tympanic cavity. When, however, a thorough examination is desired, it is better to reflect down the skin and external ear by extending the scalp incision a short distance down the neck, and dividing the attachments of the auricular cartilages subcutaneously. The whole petrous bone can now be removed by two saw cuts intersecting at the sella turcica. Holding the bone in a towel or placing it in a vise, saw in a plane extending from the posterior border of the external auditory meatus, to the anterior border of the internal. The drum membrane is exposed intact, and the tympanic cavity, mastoid antrum and anterior mastoid cells are laid open.

15. **Eye.** To examine the eye, break in the bony roof of the orbit and expose the posterior half of the eye-ball at the entrance of the optic nerve. Cut away the posterior part of the retina with a sharp pair of scissors, keeping well behind the ciliary region to avoid disfiguring the parts visible from the front, and remove it with the nerve attached. A piece of common cotton wadding placed in the orbit,can afterwards be made to give the eye a very natural appearance. The whole eyeball should not be removed without special permission.

16. **Face.** To examine the parotid gland and bones of the face, extend the scalp incision behind the ear to the angle of the jaw, and dissect down the soft parts, taking care not to cut the skin. The removal of portions of the skull or face should not, as a rule, be attempted without special permission, as it is almost certain to disfigure the features, though by filling in the defect left with plaster of Paris, moulding

it to give the proper outline, and allowing it to set before sewing up, a fairly natural appearance can be obtained. In no case must the skin of the face be cut. (See Section 37.)

17. **Nose.** By chiseling out the ethmoid bone a good view is obtained of the upper nasal passages and frontal sinus. To examine the lower and anterior parts of the nose, reflect up the upper lip, keeping the knife close against the superior maxilla, separating the alae nasi subcutaneously and dividing the cartilaginous septum.

18. **Spinal cord.** Place the body, face downward, with a block beneath the chest. Make a deep incision from the nape of the neck to the sacrum, passing close to the spines of the vertebrae the whole way. Dissect away the muscles on each side so as to expose the laminae. Note anything abnormal about the soft parts or bones.

Open the spinal canal by cutting through the laminae near the articular processes. This can be done with a saw, but it is better to use a rachitome (chisel specially made for the purpose), or simply a pair of strong bone forceps.

Remove the laminae with bone forceps or hook, and examine the posterior surface of the spinal dura, now lying exposed.

Slit open the dura along the posterior surface with probe-pointed scissors, and examine the pia mater and nerve roots.

Remove the cord by grasping the dura at the posterior extremity, and cutting the spinal nerves in succession at their points of exit. Divide the cord obliquely near the medulla, or remove it entirely if the brain has been previously removed. Slit up the dura anteriorly and examine the pia in front.

Letting the cord rest lightly over the left forefinger, make a number of transverse incisions—one or two between each pair of nerve roots. These should be made with a very sharp knife, held lightly in the right hand between thumb and fingers and moved in a sawing manner.

Note carefully the appearance of both gray and white matter on both cut surfaces, as each section is made. As the macroscopical appearance of the cord is very deceptive, if any portion appears abnormal it is advisable to snip out a minute fragment with scissors, spread it out on a slide by gently pressing a coverglass upon it, and examine it at once microscopically. A thorough microscopical examination can only be made after the cord has been hardened.

19. **Vertebrae.** When the examination of the vertebrae is of special importance, the cord had better be left alone till the thorax and abdomen have been examined; the vertebral column can then be removed and either sawn open by a median longitudinal (sagittal) incision, or, if it is desired to examine the cord as well, the incision may be made sufficiently far to one side.

A special set of chisels has been devised for the purpose of removing the cord from in front, after the removal of the thoracic and abdominal organs.

20. **Examination of the thorax and abdomen.** First open and inspect the abdomen, then dissect the thorax; finally return to the abdomen and finish dissecting it.

Place the body on its back with a block of wood under the shoulders. Stand on the right side of the body, hold the large knife firmly in the hand and make a long straight incision from the episternal notch to the pubis, passing to the left of the navel and cutting

completely through the skin. This cut should be made rapidly and with firm pressure on the knife. Open the peritoneum by a small incision in the epigastrium. Note the escape of any gas. Extend this opening to the pubis, retracting the right edge of the cut with the left hand, to avoid injury to the intestines. Note the character and amount of any fluid in the abdominal cavity. Grasp the side of the incision firmly in the left hand, divide the upper end of recti muscles and dissect off the pectoral muscles, exposing the costal cartilages and intercostal muscles with a few sweeping cuts, putting the tissues always forcibly on the stretch *before* cutting.

Note the amount and appearance of the subcutaneous fat and the state of the muscles, ribs and sternum. The mammary gland can be examined by incising it deeply from the inner surface, leaving the skin intact.

21. **Inspect the abdominal cavity,** noting the position and color of the parts exposed, the presence of abnormal substances in the peritoneal cavity, etc. This inspection should be made systematically, observing the position of liver, stomach and intestines, including the vermiform appendix, the position of the pelvic organs, the state of pelvic cavity, flanks, and hypochondria. The examination is made easier by first dividing the recti muscles subcutaneously just above the pubis and turning the abdominal walls outward. A crucial incision extending across the abdomen into each flank is sometimes necessary. If rupture or perforation of one of the abdominal organs is suspected, this point should be settled if possible before proceeding further with the autopsy; if this is neglected, and some such condition is afterwards found, a doubt may remain as to whether it may not have been made accidentally during the examination.

22. **Find the level of the diaphragm** by placing the right hand within the abdomen, and noting on each side the highest rib or space at which the finger tips of the left hand can be felt through the chest wall in the nipple line. This must of course be done before the thorax has been opened. If pneumothorax is suspected, fill the angle between the chest wall and the reflected skin with water and puncture an intercostal space below the surface, when, if air is present, it will be recognized by bubbles rising.

23. **Open the thorax** by dividing the costal cartilages just at their line of junction with the ribs. Make the opening as roomy as possible; remember that the cartilages of the lower ribs extend outward nearly to the axillary line. Cut the cartilages by pressing forcibly on the knife near the blade, holding it parallel with the chest so as not to injure the lungs with the point. If the ribs are calcified, divide them with the saw or bone forceps. The cartilage of the first rib should be divided from below about half an inch farther out than the second, on account of the width of the manubrium sterni. Open the sterno-clavicular articulation on both sides, holding the knife perpendicularly to the joint and carrying the cut round the head of the clavicle to divide the sterno-clavicular ligaments.

Raise the lower end of the sternum with the left hand and cut away the attachments of the diaphragm on each side, by thrusting the knife point through it and cutting outward. Dissect off the tissue of the mediastinum, keeping the point close against the bone. Open the right sterno-clavicular joint from below and cut round the upper end of the sternum, following the upper border of the bone into the left sterno-clavicular joint; the sternum may then either be completely removed, or allowed to remain attached

by the ligaments on the left side, being simply turned over out of the way. In raising the sternum care must be taken not to wound the great veins at the root of the neck, as in that case the blood will escape into the pleural cavity. If the veins are wounded a sponge should be placed over them to absorb the blood.

Note the position of the thoracic organs. Examine the internal surface of the sternum. Examine the anterior mediastinum and thymus or gland. Ex- the pleural cavity on each side, noting the nature and amount of any fluid which may be present.

Open the pericardium by pinching up a fold and incising it with knife or scissors, extending the incision upward to the root of the vessels.

Note the nature and amount of any fluid in the pericardial sac and the condition of parietal and visceral pericardium (epicardium.)

Note the position of the heart and the degree of distention of its chambers. If it is wished to estimate accurately the amount of blood in the heart cavities, the heart should be incised *in situ*, taking care to make these incisions where the cavities are subsequently to be opened. Feel the arch of the aorta to ascertain if an aneurism be present, in which case the aorta should be removed with the heart.

Remove the heart by grasping the apex with the left hand, lifting it outward and upward, and cutting across the vessels close to the pericardium. Cut the aorta short enough for the valves to be seen, and test their competency by pouring water into the vessel, holding up the heart by the auricles. The competency of the tricuspid and mitral valves can be tested by pouring water through a tube passed into the pulmonary artery and aorta, respectively. These tests are not very reliable.

25. **Open and examine the cavities of the heart,** following the order of the circulation—right auricle; right ventricle; left auricle; left ventricle. The incisions are best made with the large probe-pointed scissors used for opening the intestines.

I. Open the right auricle by cutting from the superior to the inferior vena cava.

II. Pass the probe-pointed scissors down the pulmonary artery and into the right ventricle and open it by an incision, passing between the segments of the pulmonary valve and extended to the apex, keeping just to the right of the septum. Examine carefully the cavity of the ventricle and the valves before proceeding further.

III. Pass the probe-pointed blade of the scissors through the tricuspid orifice, and cut across the face of the tricuspid valve, extending the incision to the apex of the right ventricle, along the right border of the heart.

The left chambers are examined in a corresponding manner.

IV. Slit open the left auricle where the pulmonary veins enter.

V. Pass the scissors down the aorta into the left ventricle, drawing the pulmonary artery over to the right so as not to wound it, and cut behind it along the left side of the septum as far as the apex. As one of the aortic cusps lies directly in the track of this incision it is difficult to avoid injuring it. Examine the interior of the ventricle and the valves before making the next incision.

VI. Make an incision from the left auricle to the apex of the left ventricle, passing the probe-pointed blade of the scissors through the mitral orifice, and cutting along the left border of the heart.

The method of opening the heart will be understood better by referring to the diagrams.

Figure 1 is intended to shew the dissection necessary for exposing the right chambers of the heart. The dotted lines indicate the course of the incisions and the arrows shew their direction. The numbers I, II, III show the order in which the cuts are to be made.

Figure 3 shews in a similar manner the incisions for the left chambers, the course of the incisions being marked by dashes numbered IV, V and VI. The pulmonary artery has been drawn over to the right.

In figure 4, the incisions for both sides are shewn in the same diagram.

As each chamber is opened remove the blood clot, observing its character, and the appearance of the valves, endocardium and heart muscle, making incisions into the muscle if necessary. Slit open the coronary arteries and examine them.

Measure with a rule the circumference of the different orifices after they are cut across, also the average thickness of the ventricular walls. The distance from its apex to the base of the nearest sigmoid cusp, is the best index of the size of a ventricle. Weigh the heart.

MEASUREMENT OF HEART.

Tricuspid orifice	$5\frac{1}{2}$	in.	13	cm.
Mitral "	$4\frac{1}{2}$	"	11	"
Pulmonary "	$3\frac{1}{4}$	"	8	"
Aortic "	3	"	7.5	"
Right ventricle length	$3\frac{1}{4}$	"	8	"
Left " "	3	"	7.5	"
Right " thickness of wall	$\frac{1}{6}$	"	0.4	"
Left " " " "	$\frac{1}{2}$	"	1	"

26. **Lungs.** Remove each lung separately, breaking down with the fingers any pleuritic adhesions that may be present. If this cannot be done without tearing the lung tissue, insert the fingers between the

DIAGRAMS

TO ILLUSTRATE METHOD OF OPENING HEART.

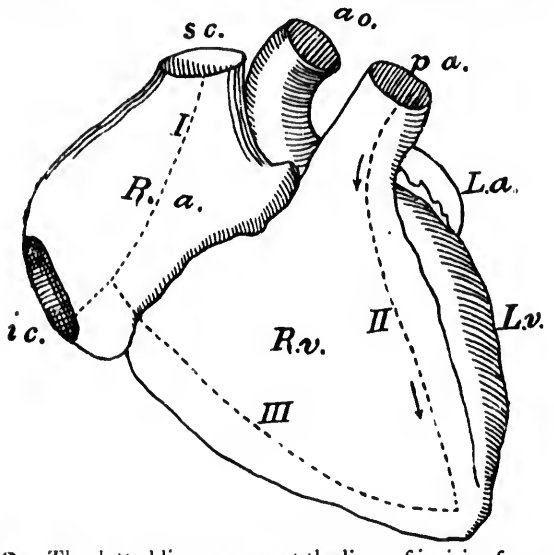


Fig. 2.—The dotted lines represent the lines of incision for opening the right chambers, and are numbered I, II and III, corresponding to the order in which they should be made.

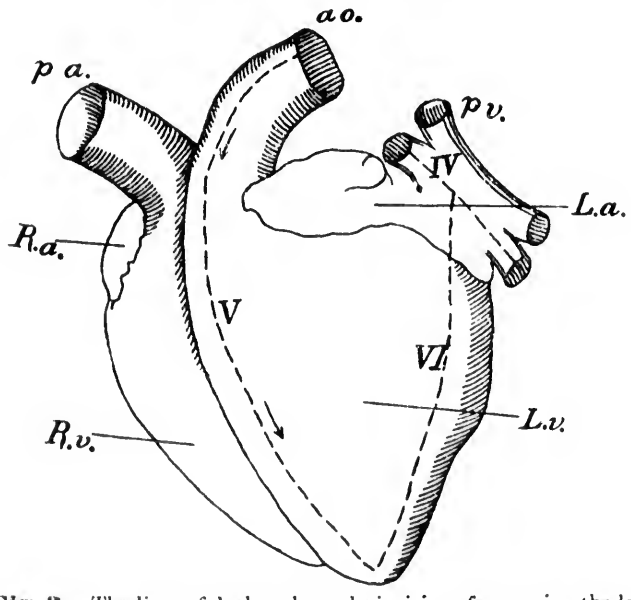
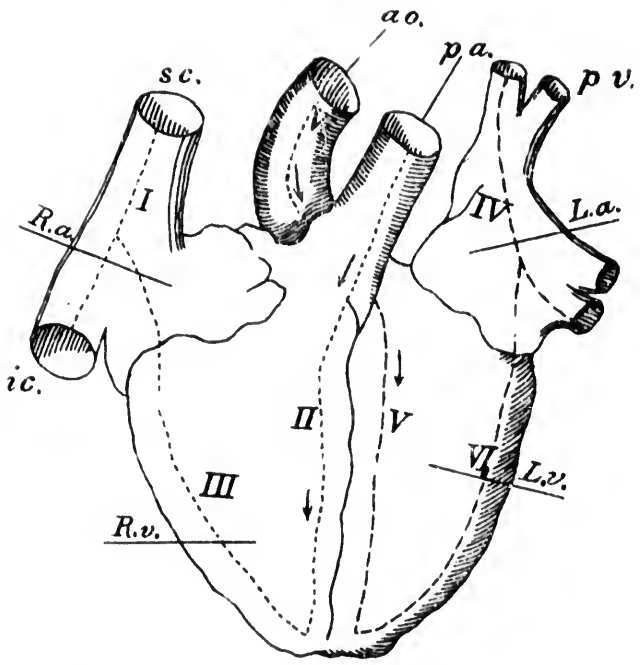


Fig. 3.—The lines of dashes show the incisions for opening the left chambers, the numbers IV, V and VI giving their order.



In **Figure 4** the incisions for bothsides are shown in a single diagram.

The lettering is the same in all the figures: R.a., right auricle; R.v., right ventricle; L.a, left auricle: L.v., left ventricle; P.a., pulmonary artery; P.v., pulmonary veins; S.c., superior cava; I.c., inferior cava; A.o., aorta.

costal pleura and chest wall, strip it off and remove it with the lung. Pull the lung forward out of the chest and cut across the bronchi, cutting close to the root of the lung so as to avoid wounding the oesophagus. Weigh the lung.

Note the appearance of the surface and the results obtained by palpation. Make a long smooth incision extending from apex to base along the posterior border, exposing as large a surface as possible. This incision is easily made if the organ is balanced on the left hand, or still better if a sponge is placed beneath it. The incision should not sever the large bronchi and vessels. Subsequent incisions can be made parallel to this one or transversely to it. Examine the cut suface as to color, consistency, texture, amount of blood, air, fluid, or solid exudation, etc. Examine the opposite lung in the same way. Slit up and examine the bronchi and vessels.

27. **Organs of neck.** Extend the original incision upwards to the level of the hyoid bone, or, if permissible, to a point one inch below the tip of the chin. Free the skin and subcutaneous tissue from the deeper parts as widely as possible on each side.

Puncture the floor of the mouth just behind the symphysis of the lower jaw, and sever the attachment of the tongue to the inferior maxilla on each side by passing the knife along the inner surface of the bone as far back as the angle of the jaw. Draw down the tongue through the floor of the mouth with the left hand. Cut across the soft palate, divide the posterior wall of the pharynx as near the base of the skull as possible and carry the incision behind the tonsils on each side. By drawing the tongue downward, the pharynx and œsophagus can be dissected off from the vertebræ, with the cervical vessels and nerves attached. At the root of the neck the vessels of the arm should

be divided on each side, by cutting outward and backward behind the head of the clavicle. The œsophagus can either be divided above the bifurcation of the trachea or just above the diaphragm. In some cases it is convenient to remove the organs of the neck together with the heart and lungs.

Examine the nerves and vessels, the tongue and sub-maxillary glands and the thyroid gland.

With probe-pointed scissors cut across the soft palate close to one of the tonsils and slit open the pharynx and œsophagus along the posterior wall. Examine pharynx and œsophagus, especially in the region of the glottis. Slit up and examine the larynx and trachea along the posterior wall, drawing the œsophagus slightly to one side. Examine the bronchial glands.

28. **Dissection of abdomen.** Remove the block from beneath the body and cut the diaphragm on each side, this will cause the liver and stomach to gravitate toward the thorax and so afford more space in the abdomen. Examine the peritoneum and omentum, removing the latter. Draw forward the large intestine, beginning at the sigmoid flexure, cutting the peritoneum and the loose cellular tissue behind it. After freeing the colon and cœcum in this manner, remove the ileum and jejunum, putting the mesentery on the stretch and separating it as near the gut as possible by making sawing cuts across it with a sharp knife. The duodenum is left to be examined later *in situ*. The intestines may be simply turned out to the left side of the body till the time comes for examining them, or they may be completely removed by dividing the commencement of the jejunum and cutting off the rectum at the brim of the pelvis—first ligaturing them if the contents are fluid. It is well to remember that the duodenum lies immediately under the ascend-

ing colon on the right side, when the small intestines are turned over to the left, and the commencement of the jejunum is found at the left side of the mesentery by turning the small bowel over to the right.

29. **Spleen.** Remove the spleen, freeing it with the fingers from any attachments which may exist, and dividing the vessels at the hilus. Weigh the organ, examine its surface, and expose the pulp by a single incision along the convex surface, in the long axis.

30. **Kidneys.** Remove the left kidney by cutting the peritoneum in front and shelling it out with the fingers from the loose connective tissue (fatty capsule) surrounding it. Cut the vessels at the hilus. Divide the ureter at the brim of the pelvis, unless it is desired to preserve the continuity of the whole urinary tract.

Weigh the kidney and examine the surface, after incising the capsule and peeling it off. Make an incision along the convex border, extending the whole length of the organ and deep enough to expose the pelvis. In making this incision the kidney should be held lightly in the left hand with the hilus toward the palm. Examine the condition of cortex, medulla and pelvis, and slit open the ureter. Examine the right kidney in the same manner.

Make a small incision into the bladder and note the character and amount of the urine.

31. **Remove the contents of the pelvis** —first cutting through the peritoneum and cellular tissue around the brim; then, holding the bladder and rectum in the left hand to put the tissues on the stretch, pass the knife around the pelvic wall close to the bone, dividing all attachments; cut the rectum across near the anus, and cut the urethra as far forward as possible under the pubic arch, depressing the handle of the knife backward.

32. **External genital organs.** In females, if it is wished to remove the external genitals, together with the pelvic organs, separate the legs widely and make an elliptical incision passing from the pubis to behind the anus on each side, including the pudenda and the whole perineum. By passing the knife under the pubic arch and separating the attachments to the pubic bones, the whole of the external genitals, as well as the perineum and anus, can be drawn into the pelvis and removed.

In males, the penis can be removed by extending the abdominal incision downward, dividing the penis subcutaneously as far forward as may be necessary, and drawing it under the pubis into the pelvis after dividing the attachments. The testes can be removed by enlarging the inguinal ring and pressing them out from below, dissecting out the course of the vas deferens if necessary. They can be returned to the scrotum after examination.

33. **Dissection of pelvic organs.** First slit open the bladder and urethra along the anterior surface and examine them.

In males, make transverse incisions in each lobe of the prostate from behind. Examine the vesiculae seminales, vas deferens and testicles.

In females, examine the external genitals. Slit up vagina along the left side and examine. Dissect the bladder free of the uterus on one side. Open the uterus by an incision anteriorly in the median line, with lateral incisions into the cornua. Examine the fallopian tubes, broad ligaments and ovaries, exposing the ovaries by an incision along convex border.

Slit open and examine the rectum.

34. **Intestines.** Slit open small and large with the "intestine scissors" by inserting one blade

in the bowel and drawing the gut against the angle formed by the other blade. The small intestine should be opened along the mesenteric attachment; the large, along one of the longitudinal muscular bands. Note the nature of the contents and examine the mucosa. To prepare the mucosa for examination after opening, draw the intestines between the first and second fingers of the left hand (which must be kept wet), rinse in a pail of clean water and spread them out on a tray or table.

Slit open the **duodenum** along its anterior surface. Note the contents and the state of the mucosa. Squeeze the gall bladder and see if bile flows from the common gall duct.

Remove the **stomach** unopened, ligaturing the upper part of the duodenum and the oesophagus, or pinching the cut ends between the fingers. Cut the oesophagus just above the diaphragm. Draw forward the stomach and dissect off the attachments along the lesser curvature. Cut the duodenum just beyond the pyloric ring. Open with probe-pointed scissors along the greater curvature, and examine the contents and the state of the inner surface The stomach can be opened *in situ* by continuing the incision from the duodenum along the greater curvature.

Raise the anterior edge of the liver and dissect the bile ducts, hepatic artery and portal vein. Open and examine **gall bladder.**

35. **The remaining abdominal organs** may be conveniently examined in the following order.

Remove the **liver** by dividing the suspensory ligament and the lateral ligaments on each side. Weigh the liver and examine the surface. Make a deep transverse incision into the upper surface of the liver, cutting deeply into both lobes.

Remove and examine the **pancreas,** making a longitudinal incision into it.

Examine the **supra-renals,** (which lie on either side of the cœliac axis.)

Examine the mesentery.

Slit open the **vena cava inferior.**

Examine the semilunar ganglia. (These are found lying close to the coeliac axis after dissecting up the vena cava.)

Examine the retro-peritoneal and retro-thoracic glands.

Slit open the **aorta.**

Examine the thoracic duct, (which lies between the aorta and oesophagus on the right side, just above the diaphragm.)

36. **Examine the extremities and trunk** if necessary. The vessels are best examined by slitting them up with probe-pointed scissors after they have been exposed. The incisions for the limbs should be made in their long axis.

37. **In order to save time,** when several students are employed at once upon the same case; the following order will be adopted:—

1. Preliminary inspection.
2. Opening of head cavity; opening of abdomen; removal of intestines.
3. Opening of thorax; dissection of brain.
4. Dissection of thorax; examination of intestines.
5. Dissection of abdomen; removal of organs of neck.
6. Dissection of organs of neck, and posterior abdominal regions.

38. **Sewing up.** At the close of the autopsy the body cavities should be carefully sponged dry, and all organs not needed for subsequent examination should be placed in them before sewing up. As it is impossible to return the whole brain into the head cavity after it has once been taken out, only return as much as will readily go in and place the rest in the abdomen. When the whole brain is retained it is better to place part of the liver in the cranial cavity to make up the proper weight of the head. All incisions are to be carefully sewn up, making the stitches at regular intervals, not more than half an inch apart, taking care to pass the needle from within to without, as the thread is then less visible. This is called the glovers' stitch.

Try to restore the natural outlines as much as possible, securing the skull cap in position by boring a hole in the skull cap on each side in the temporal region, and making corresponding holes just below the line of the saw cut. By passing copper wire through each pair of holes and twisting it tight on the outside the skull cap will be retained firmly in position. The sternum can be brought into position in a similar manner by wiring the ends of the costal cartilages. Where portions of bone have been removed the natural appearance may be restored by filling the vacancy with plaster of paris, moulded so as to give the natural outline, and allowing it to set before sewing up.

After sewing up the body, it should be carefully washed before being dressed and laid out in the coffin, and it should be seen that there is no blood oozing from any of the incisions.

39. **Autopsies in private houses.** The preparations should be as simple as possible, so as not to annoy the inmates. At the close of the autopsy

everything should be left exactly as it was found before commencing. A careful mental note should therefore be made of the position of articles of furniture, as well as clothing, wreaths, etc., before they are disturbed. Throughout the autopsy any noise, such as hammering or sawing, should be avoided as far as possible. The most scrupulous cleanliness must be observed throughout.

It is easier as a rule to remove the clothing from the body and afterwards replace it, than to avoid soiling it if it is left on. Shirts or gowns can be torn down the middle The best plan is to secure the presence of the undertaker and arrange that the body shall not be put into the coffin till after the autopsy. It is well to see also that no embalming fluid is injected, as this alters the appearance of the tissues materially.

The body should be placed in a good light. If possible obtain a table or undertaker's trestle, but when necessary the body can often be examined in the coffin. Some newspapers or a sheet should be placed beneath the body, to avoid soiling the clothing and floor. A jug of water, a couple of pails or basins, some towels and a sponge, are also needed.

Before leaving see personally that any blood-stained or dirty water has been emptied out, and that the room is well aired.

40. **Medico legal autopsies.** As the object here is to ascertain the cause of death with special reference to the possibility of foul play, everything bearing on this point should receive special attention. While any carefully performed autopsy answers the requirements of the coroner's court fairly well, there are certain special precautions not necessary under ordinary circumstances, the neglect of which renders the evidence worthless.

All details in the circumstances and surroundings under which the body was found, which may have any bearing on the case, should be carefully noted.

The body should be identified before the examination is made. Where this is impossible note with special care anything in its appearance, size, colour of hair and eyes, condition and number of teeth, any scars, tatoo marks, moles, etc., which may lead to subsequent identification. A good photograph of the body is of special value for this purpose. A plaster cast of any part may also be made and preserved.

The external examination of the body must be made with extreme care, and if any wounds or injuries are present their exact nature and condition must be stated. It is very important, in medico legal cases, to distinguish between discolorations of the skin due to hemorrhages, and those due simply to one of the two post-mortem changes, gravitation of blood to dependant parts, or from diffusion of the haemoglobin. In hypostasis the part becomes pale by simply pressing on it; in post-mortem staining it will readily be seen, by making an incision, that the colouring matter has simply stained the tissue about some small subcutaneous vessel. If on the other hand the discoloration is due to the presence of extravasated blood, the fluid blood or clot outside the vessels is easily recognized. *Doubtful spots should always be incised in forensic cases.*

The state of the pupils should be noted. The possible presence of any foreign body in the respiratory tract must always be borne in mind. When the exact time of death is unknown, special importance attaches to a minute account of the exact state of rigor mortis or putrefaction present.

When the body is exhumed in an advanced state of decomposition, it is better not to remove it from the coffin, in case it should fall to pieces. No amount

of decomposition is sufficient ground for declining to perform an autopsy, as extensive injuries of the bones and the presence of many poisons can still be recognized.

Special attention should be paid to the examination of that part suspected of being immediately concerned in causing death. This should be examined as early as possible, but even when an apparently satisfactory explanation of the death is found, the examination of the other parts should not be omitted, and all the important organs should be examined in every case.

The brain should always be examined first, unless there is ground for supposing the cause of death to lie elsewhere.

While a full and exact report of a medico legal autopsy should always be made, it is usual to submit only a brief abstract to the jury. In this the lesions found and the opinion formed are to be stated in the simplest manner possible, avoiding as far as possible the use of technical terms, and omitting from it all extraneous matter likely to offer an opportunity for raising side issues in case of a trial.

41. **In cases where poisoning is suspected,** it is well to be provided with a number of large glass jars with ground glass stoppers. These should be perfectly clean, and it is best to employ new ones. If such jars cannot be obtained it must be seen that no metal or rubber stoppers are used, as these are liable to contain traces of arsenic. For the same reason *glazed* earthenware should not be employed, though unglazed ware is free from this objection. In any case, one jar should be left unused, to show that it is free from poisonous ingredients.

Care must be taken that the portions reserved for chemical examination are not allowed to lie where

they may be contaminated, but are put at once into the jar without having come into contact with anything else.

The stomach and duodenum should be ligatured at the beginning of the autopsy. They are afterwards removed together, unopened. When they are opened it must be done over a clean glass jar, and as soon as the mucosa has been examined, placed in the jar, together with the contents, and the jar sealed. In some cases, however, it is better to send the stomach unopened to the chemist. Half the liver and one of the kidneys should be placed in another jar, and half the brain in a separate jar. If urine is found in the bladder it should also be preserved in the same manner.

The jars should be sealed in the presence of witnesses, and a label attached stating their contents. They should be given at once into the charge of the coroner, who should lose no time in sending them to a chemist.

As the existence of the hydrocyanic acid poisoning may be revealed by the characteristic odor, the moment the abdomen is opened this sign should be carefully looked for. In such a case the stomach should *immediately* be placed in a jar, made air-tight by covering the stopper with wetted parchment paper or bladder.

42. **New-born children.** In examining the bodies of new-born children it is necessary to determine (1) whether the child could have lived, and (2) whether it actually breathed, in addition to finding out the cause of death. Special attention must therefore be paid to the signs of maturity, noting the length of the child and of the different limbs, the measurement of the fontanelles, the state of development of the extremities, eyes and internal parts, the amount and nature of the hair, the presence of vernix caseosa, etc. The

centres of ossification present should be examined, especially those of the lower epiphysis of the femur.

In determining whether the child has breathed, the height of the diaphragm and the degree of inflation of the lungs are significant. The trachea should be ligatured before opening the thorax, and the lungs and heart removed together. After carefully dissecting off the heart and examining it, the lungs should be immersed in water to see if they float. They are then cut into small pieces under water, noting whether any portions float. The presence of air in small quantities is revealed by small bubbles of air rising. This test is open to too many fallacies to be of much value in doubtful cases.

For the dissection the probe-pointed scissors will be found most useful. Besides the examination of the fœtus itself, the presence of any disease in the umbilical cord and placenta should be looked for, if they are attached. The condition of the fœtal orifices should be noted in examining the heart. The abdominal incision should be carried to each side of the umbilicus, and the umbilical arteries and vein carefully dissected. In some cases a congenital abnormality may be found, sufficient to render life impossible. The brain may be removed by cutting open the thin cranial bones with strong scissors.

43. **Dissection wounds.** All wounds received in performing autopsies should be carefully attended to. A trifling prick or scratch, which is not noticed at the time, is more likely to cause trouble than even a severe cut. Beyond washing them well and applying some antiseptic dressing, no treatment is necessary. The application of caustics is more likely to do harm than good. If it is necessary to continue the autopsy, cover the part for the time with a strip of rubber plaster after washing it thoroughly. Anthrax

and glanders are specially dangerous, otherwise the chief danger is from septic cases. Typhoid fever, diphtheria and tuberculosis, do not seem to be communicable in this manner.

44. The following **report of a case** will give an idea of how a report drawn up for clinical purposes may be altered for medico legal use.

Ordinary report of autopsy:—

A. B., Aet 50. Died shortly after admission to hospital.

Autopsy performed February 12th, 1890, 12 hours after death.

Body that of a stout, heavily-built man. Post-mortem lividity well marked on back; slightly present on face and neck. Rigor mortis well marked at all joints.

Head examined first. No signs of injury to scalp or skull-cap. A small reddish discoloration of the skin is found on left temple; tissues beneath it are free from echymosis.

Pacchionian bodies large and numerous. Longitudinal sinus contains a small blood clot. External surface of dura normal. On removal of dura, vessels of pia nearly empty. A little bloody fluid lies beneath the pia, chiefly in the sulci, less abundant over the convexity than laterally; the condition symmetrical on both hemispheres.

On removal of brain, a large, soft, dark-red clot is found covering the whole of the base. It lies principally beneath the pia, and extends a little way along the sylvian fissure on each side. The clot is thickest just anterior to the optic chiasm near the origin of the anterior cerebral arteries. A large amount of extravasated blood is found in the anterior part of the longitudinal fissure. The frontal lobes are with difficulty separated. A small aneurysmal dilatation, the

size of a cherry, is seen in the region of the anterior communicating artery. This adheres closely to the inner surface of the right frontal lobe, and shows a small rent 5 mm. long, with ragged edges, through which a clot protrudes.

On dissecting the brain, both the lateral ventricles as well as the third and fourth ventricles, are distended with smooth, dark-red clot. This forms a complete cast of all the ventricles. The brain tissure lying between the aneurysm just described, and the head of the right corpus striatum is lacerated and infiltrated with soft dark clot, the head of the right corpus striatum itself being also infiltrated, but to a less extent. The rest of the brain presents nothing abnormal. The brain substance is firm and somewhat pale.

On dissecting the arteries at the base, some fibrous thickening is noticed in the pia about the aneurysm, most marked on the right side. The whole of the anterior communicating artery is found to be dilated. The sac contains recent clot only and opens directly into the right and left communicating arteries. The orifice in the left side is large and circular in form, measuring 5 mm. in diameter, the orifice on the right side is 2.5 mm. in diameter. All the cerebral arteries are large and thin walled, their intima appearing free from atheroma. Examination of the base of the brain shows nothing abnormal. The sinuses contain a little fluid blood and dark clot.

In opening abdomen, subcutaneous fat 5 cm. thick in most places. Omental fat abundant, peritoneum normal. Diaphragm on right side at 4th space, on left side at 5th rib, in mammary line.

In thorax pleura normal. Pericardium normal; contains a teaspoonful of clear serum. Epicardial fat not in excess. Right chambers of heart moderately distended with blood; left chambers empty. Organ feels firm, muscle pale, valves normal. Weight, 500

grammes, wall of right ventricle averages 5 mm. in thickness; of left ventricle, 2 cm.; length of right ventricle, 8 cm.; of left 7.5 cm. Circumference of aortic orifice 7.5 cm.; of pulmonary, 8 cm.; of mitral, 10 cm.; of tricuspid, 13 cm.; coronary arteries normal.

Aorta elastic and not atheromatons.

Lungs—Left weighs 600 grammes, crepitant throughout. Bases contain a good deal of blood. Bronchial mucosa reddened Right lung weighs 680 grammes; is in same condition.

Oesophagus, larynx and trachea normal, thyroid gland normal.

Spleen weighs 215 grammes, pulp dark and soft.

Kidneys—Left weighs 150 grammes, capsule readily removed, surface slightly granular, a few small cysts in cortex. Right weighs 155 grammes, is in same condition.

Supra-renals normal.

Bladder contains 400 cc clear urine. Mucosa normal. Lateral lobes of prostate slightly enlarged.

Intestine normal; contains ordinary bile stained faeces.

Duodenum normal; gall ducts pervious.

Stomach contains a little liquid food.

Pancreas normal.

Liver—Weight 1680 grammes. A few dark bluish spots on upper surface beneath capsule. A small angioma the size of a pea in right lobe.

Gall bladder full of dark bile.

On microscopical examination, no sign of fatty degeneration nor miliary aneurysms in the small arteries of the brain.

Anatomical diagnosis: Rupture of aneurysm of anterior communicating artery; hemorrhage into cerebral ventricles. Angioma of liver. Interstitial nephritis. Hypertrophy of left ventricle.

45. **Report abriged for coroner's jury.**

Body identified as that of A. B.

Autopsy performed February 12th, 1890, at 2 p. m., 12 hours after death.

No sign of violence externally. Rigor mortis well marked.

On examining the brain there was found an extensive apoplexy arising from the bursting of a small blood vessel in the brain. There was no evidence of this having been caused by an injury. The kidneys showed signs of chronic inflammation, and the heart muscle was thicker than normal. The other organs showed no changes of importance.

The autopsy shows that the deceased died a natural death, from the bursting of a blood vessel in the brain. This vessel was weakened from dilatation of its walls, and the condition of the heart and kidneys would tend to cause its rupture.

Signed, ...

AVERAGE WEIGHT OF NORMAL ORGANS.

Brain.....	48 oz.	.....	1400 grammes.
Heart	12 "	.....	300 "
Lung.....	20 "	.....	600 "
Liver.....	60 "	.....	1800 "
Spleen.....	6 "	.....	170 "
Kidney	5 "	.....	150 "

In females the weight is about 5 or 10 per cent less.

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