Lastly, although the presence of pericardial and pleural effusions proved to be the correct diagnosis, how is it possible, you may ask, that they should have brought about the dilated left pupil, and the small left radial pulse? I believe that the real cause of these symptoms lay in the extreme fibrosis of the apex of the left lung, which excited pressure on the sympathetic nerve and on the subclavian artery, and that the intermittence of these symptoms is to be explained by the alterations in the intra-thoracic pressure, due to a varying amount of pericardial and pleural effusion.

I have said little with regard to the pulmonary signs noted during life, and their explanation as witnessed in the *post-mortem* room. I expected to find signs of consolidation at both apices, with evidence of double pleurisy, and I was not disappointed; the large effusion on the right side was clearly of recent occurrence, and its rapid accumulation proved fatal to the patient. Although the pulmonary signs there were comparatively easy to understand, yet I believe that read in the light of the *post-mortem* examination, they had an important bearing on the patient's illness. Apparently the inhalation of granite dust induced fibrosis of the lungs, which, slumbering for awhile, broke out anew, and resulted in the pericardial and pleuritic effusions which gave rise to the peculiar symptoms that I have endeavoured to interpret to-day.

METHOD OF PREPARATION OF LARGE SECTIONS OF THE LUNG.¹

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ONCE Professor Hamilton had introduced his most valuable process of making large sections of the whole brain, the application of his method to other organs became merely a matter of time, necessity, and opportunity. Whilst working at the subject of phthisis I saw how invaluable such a method would be for demonstrating the localisation of tubercular and other lesions in such an organ as the lung, and during the period that I was working with Professor Greenfield a number of the lung sections to be demonstrated were so prepared. Since that time I have, in connection with my work as Research Scholar of the Grocers' Company, prepared a very large number of sections of various forms of diseased lungs.

The *modus operandi* is as follows: After the first incision through the lung—which should be made in the direction in which you wish to have your sections, usually from apex to base and from the antero-external angle of the lung down to the root, so as to obtain as large a section as possible—a second incision is made parallel to the first, so that a thin slice, not more than half an inch in thickness, is obtained. This slice is carefully hardened in Müller's fluid for five or six weeks. The hardening must be as perfect as possible, if even moderate success is to be attained. I find that the best way to accomplish this is to lay the section out flat in a dish on a layer of lint, then to cover with several layers of lint, and immerse the whole in Müller's fluid, a plate of glass or weighted wood being used to keep it down. Spirit also hardens the sections well, and in some cases this reagent may be used, but it must be remembered that it is somewhat difficult to get rid of the whole of the spirit without softening the textures too much; especially is this the case in warm weather; but it may be done by running a continuous stream of water over the section for about thirty-six hours before further preparation. The specimens hardened in Müller's fluid need not be washed with water for more than twenty-four hours. The slice of tissue is then placed in a mixture of five parts of mucilage (*B.P.*) and four parts of a syrup made by boiling 20 ounces of sugar in a pint of water. The proportion may be varied a little in winter by using only three parts of the syrup. Two to the ounce drops of carbolic acid may be added to prevent the formation of fungi; the tissue should be soaked in this for forty-eight hours at least, but it may be left for a fortnight or even a month without injury.

The microtome used is one modified by Dr. Alexander Bruce, in which are combined the best features of both the Hamilton and Williams microtomes. It consists of a large square tub in which are fixed nine brass pillars; to the top of these is screwed a large

zinc plate. To the tub are fixed a couple of rails similar to those on the bed of a metal planing machine, and on these rails runs a heavy plane, to which is attached a knife blade fixed at an angle of 45°. This knife is moved upwards and downwards by means of a fine screw, which is so adjusted that sections of very great delicacy may be cut (if the knife is sufficiently well sharpened). The best and cheapest knives are those made for paper cutters' guillotine machines. To this microtome I have added for the sake of convenience and rapidity of working, first, a second metal plate which may be screwed to the fixed plate, so that after a few sections have been obtained, the plate with the piece of tissue may be removed and put aside until again required; and, second, a tin box about 4 inches deep with a bottom an inch from the lower part of the sides, which fits over the second plate. It is provided with a lid, has the bottom sloping to one end, and has an outlet pipe to which a piece of india-rubber tubing may be attached.² Tub and tin box are both filled with ice and salt. The section is taken from the gum and syrup, carefully dried with a soft clean cloth, and then placed in *B.P.* mucilage until the surface is thoroughly saturated (ten minutes is quite sufficient for this), after which it is transferred to the freezing plate, on which a very thin layer of gum has been laid. The section becomes fixed immediately. It must then from time to time be carefully banked up with gum, the tin freezing box being placed over it during the intervals. When nearly frozen, take a long thin knife and pare the tissue down to the level of the rails. Now prepare a large clean white flat dish, fill with slightly warm distilled water, to which a little syrup may be added (especially if the tissue is at all brittle), and place it in front of the tub, about an inch below the level of the sections, so as just to clear the plane. In this lay the sheet of glass which is to serve as the cover glass. This should be considerably larger than the section. The glass I find best suited for the purpose is thin rolled plate, which is to be obtained only from Messrs. Chance, of Birmingham. Bring the knife down to the level of the tissue by means of the screw, and cut away all fragments till a complete section is obtained. The first complete section, if thin enough, is spread out with the aid of a camel hair pencil on the glass, on which it is carefully removed from the water and transferred to a second vessel containing distilled water, where it is allowed to stand for a few hours in order that all the mucilage and sugar may be thoroughly washed out.

The sections may be mounted either as they are, unstained, or they may be stained with alum-carmin, picro-carmin, or ordinary ammonia-carmin; but I find that the two former are the most satisfactory reagents. In staining with picro-carmin, a rapid staining on the slide, with no after-washing except around the section, is best. For the alum-carmin staining the best method is to transfer the cover glass with its section to the staining fluid, where it may be left for a night. It is then put back into distilled water, and is there thoroughly washed in order that all alum crystals may be removed. In order to clear up some of the unstained sections, Hamilton's liquor potassæ method may be used. After the sections have been thoroughly washed, he pours over the surface with a pipette a strong solution of liquor potassæ and water. Strength of 1 to 4 gives the best results. When thoroughly cleared up the section may be mounted.

To imbue and mount these sections, take a quantity of gelatine (Nelson's, or Cox's and Coignet's), wash well and cover with a saturated and filtered solution of salicylic acid; allow to soak all night, so that a considerable quantity of water may be absorbed. Pour off superfluous water and heat over a water bath until the whole is thoroughly melted; add one part by measure of this to two parts of glycerine, heat over a water bath, stirring regularly until the whole is thoroughly mixed; strain through a piece of close clean flannel into a flask, in which it may be reheated over the water bath as required. When not in use the flask should be kept corked.

Having allowed most of the water to drain away from the section by tilting it against some object, with the glass protecting the section from dust (it must not be allowed to dry, or air-bubbles will be enclosed in the section and it will be spoiled) it is placed, section upwards, on a level stand (a screw tripod serves the purpose admirably), and a thin layer of the warm glycerine jelly is run gently over the surface of the section by means of a pipette. Great care must be taken not to allow the jelly to run too rapidly, or the margins or even the whole section may be displaced. It is then set aside to cool, after which, if kept away from dust

¹ A description of a demonstration in the Section of Pathology at the Annual Meeting of the British Medical Association in Dublin.

² This microtome is made by Mr. Alexander Fraser, Lothian Street, Edinburgh.

and heat, it may be left for a week or two until time and opportunity be found to finish it off.

This finishing-off process requires a little practice, but is not difficult. The slide on which the section is to be mounted is placed on three or four pieces of cork over a water bath until it is warmed through. This is to prevent the too rapid setting of the jelly. It is then transferred to the tripod, and a quantity of jelly is poured on to the centre and gradually on to the end nearer the manipulator; the cover glass is then taken and gently lowered, the near end first and so gradually down on to the slide. The jelly on the cover keeps the section in position sufficiently long to allow of the cover glass coming into its place. The slide usually retains sufficient heat to melt away all superfluous jelly. Should this not be the case, the whole slide may be again heated over the water bath, and by the application of gentle pressure the extra mounting medium is squeezed out. If this extra medium be left at the margin of the cover, the slide may be left for some time without further treatment. To preserve the section remove the extra jelly with a spatula, wipe carefully with a moist cloth and then with a dry one. After this the margin of the cover glass and the slide should be carefully painted over with benzole balsam, layer after layer being applied at intervals of two or three days, until there is a good firm coating. Unless this be done at once after clearing off the extra jelly, the jelly at the margin under the cover dries rapidly, air bubbles make their way in, and once there, will eventually spoil the section. At one time I afterwards pasted first a layer of calico and then a strip of black glazed paper over the edges of the slide. I have found, however, that it is better to mount them in common wooden frames like slate frames, so that the cement may be examined from time to time, and if necessary repaired. The sections are now ready for examination.

List of specimens exhibited by means of limelight lantern with 9-inch condenser, kindly lent by Dr. Alexander Bruce, of Edinburgh: Specimens of normal lung (1) uninjected, and (2) injected with carmine gelatine; (3) sections of emphysematous lung uninjected; and (4) injected with Prussian blue to show the normal structure and arrangement of the blood vessels, alveoli, and air passages, and the altered conditions in emphysema.

5. Lung of child in which lower part of upper lobe had been invaded by tubercle. The gland at the root apparently corresponding to this area is much enlarged, and evidently caseous; radiating from this to the surface are masses of tubercle, some small and not caseous, others larger, apparently formed of several smaller nodules fused and now become caseous. Here septa are slightly thickened, and the tubercle nodules are apparently commencing in the small lymphatic nodes.

6. Tubercular catarrhal pneumonia in the lung of a child. The lobular distribution is very distinctly marked, small areas of healthy tissue appearing here and there. Away from the large consolidated patches are small tubercle nodules, evidently growing in the inter-alveolar or small interlobular septa. Here also the glands are enlarged, caseous, and tubercular.

7 and 8. Other sections in which the patches of catarrhal pneumonic consolidation are not quite so typical, and in which there is more marked interstitial tubercle.

9. Miliary tuberculosis in child. Section injected with Prussian blue and stained with picro-carmin. In this the tuberculosis appears to have spread by the lymphatics, but catarrhal changes have quickly supervened. An examination points, however, to the fact that the tubercle is primarily strictly confined to the interlobular septa. The glands at the root are enlarged and caseous. The non-vascular condition of the tubercle nodules is well seen in this specimen.

10. Section of acute miliary tuberculosis. Here the nodules are very small, and are quite distinct in appearance from anything we have yet seen. They are found commencing in the interlobular septa, and have evidently arisen in connection with infection by the lymph channels or blood vessels. Around some of these points catarrhal changes may be observed, but they are comparatively little marked. The patches are very different from those that are due to infection by the air passages.

11. Lung with well marked catarrhal pneumonia in lower lobe. In the upper lobe is a large gangrenous cavity, opening directly into the large bronchus. In the walls of this cavity we have a slight development of granulation tissue in which is a considerable quantity of altered blood pigment.

12. Section of lung from a case of chronic fibroid phthisis with emphysema. At the apex are small cavities filled with partly caseous, partly calcareous, material. The walls are composed of

deeply pigmented fibrous tissue, which, by its contraction, has caused a puckering of the thickened pleura at the surface. The pleura is thickened over the whole lung, and the two lobes are firmly bound together. A few firm fibroid nodules are to be seen scattered throughout both lobes.

13. Typical case of phthisis. Chronic fibroid phthisis at the apex; thickened pleura and septa. Small cavities with fibroid, deeply pigmented walls, little normal tissue left; base consolidated, catarrhal and caseating pneumonia well marked; a few masses of racemose tubercle throughout the lobe. There is evidently considerable congestion in the lower portion of the lung.

14, 15, and 16. Similar specimens from other cases.

17. Stonemasons' phthisis. Lung much consolidated; pleura enormously thickened; lobes adherent; several cavities with thickened fibrous and pigmented walls; nodules of chronic fibroid thickening, firm at the margin, frequently deeply pigmented, and in some cases caseating in the centre; septa thickened. The glands at the root are enlarged, dense, and fibrous; medullary portion deeply pigmented; cortex free from pigment.

18. Section of coal miner's lung with thickened pleura. Small, deeply pigmented, fibrous nodules, paler in the centre, darker at the periphery; no cavities. The distribution of the pigment in the deep layer of the pleura, the interlobular septa, and the lymphatics around the vessels and bronchi is here well seen.

Other specimens of pulmonary infarction, tubercle of the liver (acute miliary in the tissue of the portal spaces, and caseating tubercle affecting the bile ducts), waxy spleen, showing localisation of the disease in the Malpighian bodies, old infarction of the spleen, in which a fibrous and contracting capsule around the caseating or softening central mass is well seen; waxy kidney (large and small forms), granular contracted kidney, waxy liver, cancer of the lung, etc., were exhibited.

A METHOD OF EXAMINING AND REMOVING THE SPINAL CORD FROM THE FRONT.

By THOMAS HARRIS, M.D.LOND., M.R.C.P.,

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THE method of examining and removing the spinal cord which is adopted in the majority of the pathological departments of the hospitals of the United Kingdom is by means of a median incision along the posterior aspect of the body, the laminae of the vertebrae from the cervical to the lumbar region being subsequently removed with the aid of a saw, or of a saw assisted afterwards by a strong pair of bone forceps. In the majority also of the German universities a similar method is employed. However, as far back as 1863, Professor Brunetti, of Padua, published¹ an account of a method which he had introduced for removing the cord from the anterior aspect of the body by means of specially constructed chisels, with the aid of which he removed the bodies of the vertebrae, and so exposed the interior of the vertebral canal. This method has been employed in the Pathological Institute at Vienna for the past fifteen or twenty years, and having heard very favourable accounts as to the advantages of the method, I took an opportunity last autumn of visiting Vienna, chiefly with the object of becoming practically acquainted with the details of the process. Since that time, I have adopted it in the *post-mortem* department of the Manchester Infirmary, and finding it most expeditious and in many ways convenient, a short account of the method may not be unacceptable to those who have many *post-mortem* examinations to make, and who have not yet tried it. A brief notice, by Dr. Cayley, of the method will also be found in Quain's *Dictionary of Medicine*.²

The organs in the neck, thorax, and abdomen are first examined, by means of the usual median incision from the chin to the symphysis pubis, and are all removed from the body, so that the anterior and lateral aspects of the bodies of the vertebrae are exposed along the whole length of the spine. After the exposed parts of the vertebrae have been examined, a wedge-shaped wooden block³ is placed under the body

¹ *Gazzetta Medica Italiana Provincie Venete*, Anno vi, Nos. 17, 18, 19, 20.

² *A Dictionary of Medicine*, edited by Richard Quain, M.D., F.R.S., 1st Edition, page 1020.

³ A convenient block for this purpose is one 12 inches long, 6 inches high, and 6 inches broad at the base.