

division of primitive and more diffused single stars. But if this theory is correct we should expect the orbit of a double star to be approximately circular; yet this is so far from being the case that the eccentricity of the orbits of many double stars exceeds by far any of the eccentricities in the solar system. Now See has pointed out that when two bodies of not very unequal masses revolve round one another in close proximity the conditions are such as to make tidal friction as efficient as possible in transforming the orbit. Hence we seem to see in tidal friction the cause which may have sufficed not only to separate the two component stars from one another, but also to render the orbit eccentric. I have thought it best to deal very briefly with stellar astronomy in spite of the importance of the subject because the direction of the changes in progress is in general too vague to admit of the formation of profitable theories.

We have seen that it is possible to trace the solar system back to a primitive nebula with some degree of confidence and that there is reason to believe that the stars in general have originated in the same manner. But such primitive nebulae stand in as much need of explanation as their stellar offspring. Thus, even if we grant the exact truth of these theories the advance towards an explanation of the universe remains miserably slight. Man is but a microscopic being relatively to astronomical space and he lives on a puny planet circling round a star of inferior rank. Does it not, then, seem as futile to imagine that he can discover the origin and tendency of the universe as to expect a house fly to instruct us as to the theory of the motions of the planets? And yet, so long as he shall last, he will pursue his search, and will no doubt discover many wonderful things which are still hidden. We may, indeed, be amazed at all that man has been able to find out, but the immeasurable magnitude of the undiscovered will throughout all time remain to humble his pride. Our children's children will still be gazing and marvelling at the starry heavens but the riddle will never be read.

REMOVAL OF A LARGE PIN FROM THE LOWER LOBE OF THE LUNG BY TRANSPLEURAL PNEUMOTOMY.

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With Notes on the Radiographic Methods employed, by WILLIAM R. FOX, L.R.C.S., L.R.C.P. Edin., *Honorary Physician to the Melbourne Benevolent Asylum.*

(With Illustrative Plate.)

I HAVE been unable to discover the record of any case in which the chest has been opened in the free manner employed in this instance for the purpose of extracting a foreign body from the lung and I conclude, therefore, that the features of interest that are presented by it are unique in kind. I am indebted for the earlier notes to Mr. H. W. Bryant, under whose care the boy came in the first instance.

The patient, aged 12 years, was admitted into the Alfred Hospital, Melbourne, under my care on Sept. 12th, 1903, with the following history. Five weeks previously he was sitting in a rocking chair holding in his mouth a large black-headed shawl pin, three inches in length, when the chair was suddenly tilted, and in the effort to save himself the pin disappeared down his trachea without any cough or spasm of the glottis. No symptoms of any kind appeared to have supervened until a week later, when he began to be troubled with a cough, and a week later still the sputa became blood-stained. Three weeks after the occurrence he was examined radioscopically by Mr. W. R. Fox, and the pin was seen to be in the left bronchus, the head lying two and a half inches below the bifurcation, the point projecting into the trachea. It was suggested by Mr. Fox that an attempt should be made to extract the pin with an electro-magnet which he undertook to devise and construct, and as it was thought likely that tracheotomy might be required the patient was admitted under my care into the Alfred Hospital. Without going into unnecessary detail it was found at a subsequent examination made by Mr. Fox that the pin had travelled down into the lower lobe of the lung and that all idea of extracting it through the trachea would have to be abandoned. The boy's symptoms

on admission were exceedingly slight; there was a little irritative cough and occasionally a streak of blood was expectorated; there was also a slight irregularity of temperature, which sometimes rose to between 99° and 100° F. at night; otherwise he appeared to be in excellent health and careful auscultation revealed nothing.

On radioscopic examination the following points were noted. The pin was readily seen lying in the lower part of the left lung, the point being directed obliquely upwards towards the trachea (Fig. 1). At each cardiac pulsation the point of the pin rose and fell as though it were resting upon the base of the heart. The position of the head could be easily indicated on the chest wall by examining in two positions, antero-posteriorly and laterally, and marking the spot coinciding with the head in either position. It was then found that when viewed antero-posteriorly the head was about on a level with the eighth rib; when viewed laterally it lay in a vertical plane corresponding to that of the posterior fold of the axilla. The project of extracting the pin through an opening in the chest wall looked as though it should be an easy matter; nevertheless it was novel work, and I had reason to be very glad that before undertaking it upon the living I sought an opportunity of studying the matter in the dead-house.

The results of my experimental investigations with a similar pin and a lung removed from the body were as follows. In the first place, it was clear that the pin had passed into the main bronchus of the lower lobe of the lung, which corresponded exactly with the position of the pin as shown by the rays. Secondly, I ascertained that by grasping the lobe firmly between the fingers and thumb and making a slight rocking movement I was able with a little practice to detect the rigidity caused by the presence of the pin. The observation which was really the most important of all, however, was concerned with the extreme slipperiness of the foreign body in the bronchus. I found that having once grasped the lung containing the pin it would never do to let go or to relax the grasp until the pin was extracted. Anything in the nature of fumbling caused the pin to slip away with great readiness and as it would then be travelling point first, the point being, moreover, in close proximity to the great vessels at the base of the heart, the dangers that might result from maladroit handling were obvious and very real. Upon these considerations the following operation was planned and carried out.

Operation (Oct. 2nd).—The boy being placed on his right side, a free curved incision with the convexity downwards was made and the flap thus marked out was reflected upwards. A portion of the left eighth rib six inches long was then removed from the postero-lateral part of the chest and air was cautiously permitted to enter the pleura through a small puncture. The resulting collapse of the lung was not attended by untoward symptoms and the pleura was opened up to the full extent of the wound. Ample room was afforded; the fingers of the left hand were passed between the lung and the diaphragm, the lower lobe grasped near its root and gently drawn towards the opening. It was now possible to recognise the rigidity caused by the presence of the pin. Maintaining a firm hold with the left hand the position of the head of the pin was ascertained by gently palpating the surface of the lung with the right fingers. A small incision was made in the lung over the pin's head; a sinus forceps, unopened, was pushed in until the pin was felt and by hitching the instrument under the neck of the pin the head was easily lifted out of the wound and the pin was withdrawn. There was no hæmorrhage but it is a notable circumstance that abscess formation had already begun round the foreign body, for when the head of the pin was reached a small quantity of pus (10 or 20 minims) escaped. No suture was put into the very small wound in the lung. The flap of integument was replaced and sutured with the exception of about two inches in the middle. This was left unclosed by sutures and a piece of oiled silk protective was laid over it before the dressings were applied; by this means free escape of air from the pleura was insured, while the piece of protective by its valvular action would impede the passage of air back into the pleura and thus encourage the expansion of the lung. Immediately after the operation there was great restlessness, which was relieved by a small dose of morphine, and for two or three days there were some dyspnoea and general distress, which, however, steadily diminished. There was also moderate fever, the temperature ranging between 99° and 100°, and examination of the chest revealed very

TO ILLUSTRATE MR. R. HAMILTON RUSSELL'S AND MR. W. R. FOX'S CASE
OF REMOVAL OF A PIN FROM THE LUNG.

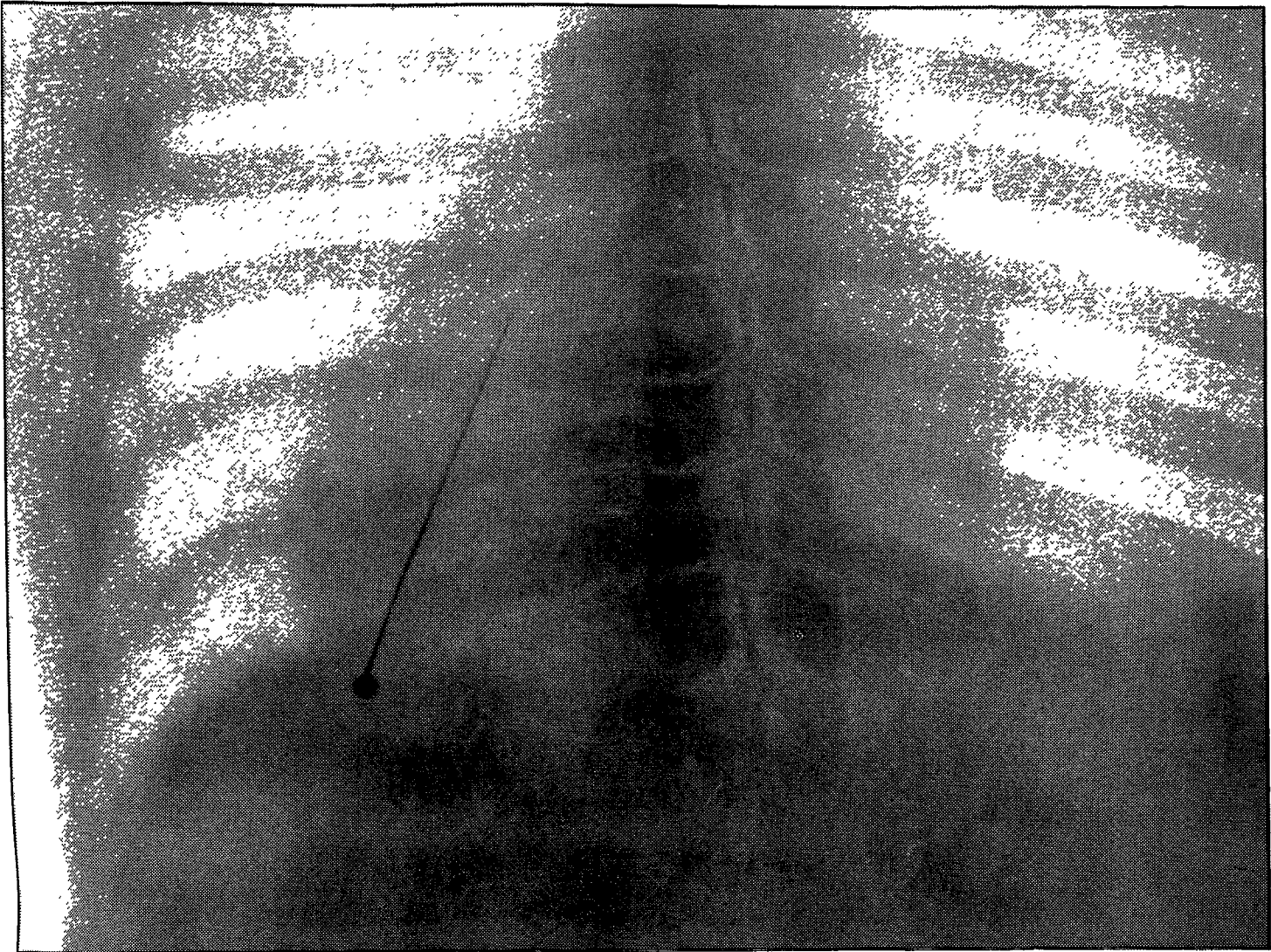


FIG. 1.—The Pin as seen in a Radiogram.

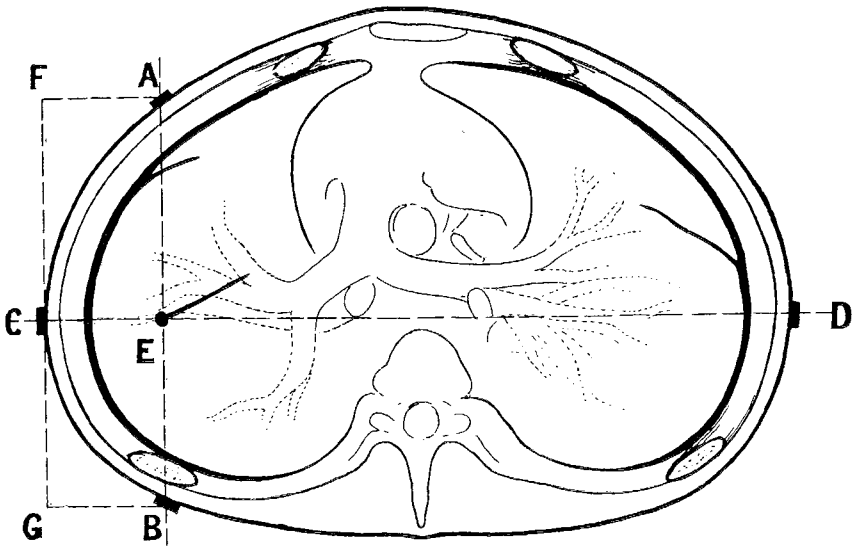


FIG. 2.—Diagram shewing position of localising points

- AB—The true antero-posterior horizontal line, settled by situation of E, the head of the pin.
- CD—Line extending from side to side at right angles to AB, and passing through E.
- FG—Line parallel to AB and passing through C.
- GB and FA—(Lines parallel to CE, and the same length) indicate the depth of E.

general consolidation of the lobe from which the pin had been extracted. By the fourth day, however, convalescence fairly set in, the temperature became normal, the appetite returned, and all discomfort vanished. The wound in the chest wall did not pursue a strictly aseptic course and there was some suppuration about the stitches. This I attribute to accidental infection from the pus round the pin during the operation. Happily no suppuration of the pleura took place and healing progressed kindly and rapidly under a moist dressing, so that the boy was able to leave the hospital perfectly well 12 days after the operation. The very difficult problem of photographing so slender an object as a pin while it was subject to constant movement produced by both the cardiac and respiratory cycles was solved after one or two attempts by Mr. Fox, but it will be readily understood that the photograph does not depict the foreign body with the striking clearness with which it was viewed by means of the fluorescent screen.

Remarks.—There is obviously a very broad distinction to be drawn between the procedure here described and the exceedingly difficult and unsatisfactory attacks that have been made on the large bronchi through the mediastina. The transpleural method used in this case will certainly be occasionally employed in the future, thanks to the aid the surgeon is now enabled to claim from the skiagraphist, and one can conceive of no more brilliant illustration of the value of radiography in surgery. Other features that appear to me specially noteworthy are: (1) the fact of abscess formation having already commenced; (2) the lobar consolidation subsequent to the operation; and (3) the suppuration of the chest wall without suppuration of the pleura, although the two structures were in widely open communication with one another. Finally, I would venture strongly to urge upon any surgeon who contemplates a procedure of this nature that a little special *tactus eruditus* acquired beforehand in the dead-house will prove invaluable.

Notes by Mr. Fox.—This patient was sent to me for x ray examination by my friend Mr. Bryant on August 27th, 1903. A shawl pin had disappeared in the circumstances detailed in Mr. Russell's account of the case and it was thought that it had been swallowed. Examination by the x rays at once showed this supposition to be incorrect and revealed the shawl pin lying in the left bronchus. It was then over three weeks since its disappearance. As its point was in the trachea near its bifurcation it was thought that it might be possible to remove it through an opening made into the trachea below the isthmus. As the point of such a pin is, however, a very difficult object to be grasped by, and extracted in, the jaws of a pair of forceps I formed the opinion that it might be practicable to use a powerful electro-magnet in the event of forceps failing to extract it. Experimental investigation, however, showed that an electro-magnet of diameter sufficiently small not to occlude seriously under an anæsthetic the small trachea of a boy 12 years old possessed an inadequate magnetic pull unless exerted over a sufficiently large surface of the object to be removed. Now the position of the pin was such that it practically presented its point to the electro-magnet, and the fact that the magnetic lines of force had thus to act upon a point, combined with the limited size of the magnet itself, rendered it impracticable to remove the pin in this way. Experiments carried out with a very large Haab magnet and iron extension pieces suitable for pushing down the trachea to reach the pin proved this to possess no greater power. The idea of utilising an electro-magnet had thus to be abandoned.

It was then determined to endeavour to extract it by the tracheal route by means of ordinary forceps and as Mr. Bryant was leaving Melbourne for a week or two the case was kindly taken in hand by Mr. Russell and admitted to the Alfred Hospital, with the excellent and highly gratifying result recorded. Another x ray examination was then made with this view, when it was found that meantime the pin had found its way so much farther down the bronchus that it had become impracticable to reach and to extract it through a tracheal opening. The pleural route was then determined upon and I was asked to locate exactly the round glass head of the pin. To do this I adopted a method the principle of which is precisely similar to that I advocated in a former issue of THE LANCET¹ and which I have employed on numerous occasions since. It consists of ascertaining the exact position of two straight lines in the same plane intersecting one another at right angles, the point of intersection being occupied by the object

to be located. The most suitable plane for these lines to be in is one at right angles to the axial line of the body. This affords the easiest and most useful measurements. This plane is represented in the diagram (Fig. 2), in which A B and C D are the two lines at right angles to each other. The line A B is found by taking two small circular discs of lead and attaching them to the skin by means of fish-glue or some similar material. By means of the x rays and a fluorescent screen these two metal discs are moved about, sliding them on the surface of the skin until the disc at A, the head of the pin at E, and the other disc at B are all in one straight line (A B). Such a line to be in the above-mentioned plane should be, with the patient standing, as nearly as possible a horizontal one. The discs A and B are so placed that A B is a true antero-posterior line. In an exactly similar manner the line C D is mapped out, this being also a horizontal line at right angles to A B and extending from side to side instead of antero-posteriorly. Now F G is a line drawn parallel to A B and passing through C, while G B and F A are each parallel to C E. Now F A = G B = C E, which is the depth the head of the pin E is in the cavity of the thorax from the position of the disc at C. From this it should be quite clear that C (which in this particular case is the nearest point to the object sought) gives the position where the opening into the pleura should be made and the requisite amount of rib in that location excised, while C E (or what is the same thing, G B or F A) gives the depth the operator must go in the direction of D to reach the head of the pin. The collapse of the lung on opening the pleura in this case of course alters the position of the pin in the thorax, but that can scarcely be held to vitiate the method of location.

An attempt to photograph the pin in position was at first a complete failure, no pin showing in the photograph, although it was very plainly visible on the screen. The fault lay in the free movement of the pin with the lung during respiration and by controlling diaphragmatic action and stopping this up-and-down movement a good photograph was at once obtained.

A curious point about this case that should be noted is that the pin fell into the left bronchus and not into the right. It is a well-known fact that when a foreign body enters the trachea and falls below its bifurcation it nearly always enters the right bronchus, rarely the left. In the event of no signs or symptoms being present (as in this case) to indicate its position and in the absence of an x ray examination one can easily imagine a surgeon who suspected that it had dropped down the trachea diligently but vainly exploring the right bronchus. The case is altogether an excellent illustration of the immense assistance x ray examination affords in suitable cases to the operating surgeon.

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THE PATHOLOGY AND TREATMENT OF ECLAMPSIA.

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THERE is no more interesting subject in the whole range of obstetric medicine than eclampsia, and yet, despite the recent advances in every department of medical science, our knowledge of convulsions occurring in pregnancy, during labour, and after delivery, is still anything but accurate, defined, or scientific.

THE PATHOLOGY OF ECLAMPSIA.

Two views at present hold the field as to the pathology of eclampsia. 1. Our present position, according to one view, corresponds to that of our predecessors in the last century in reference to dropsy. We call convulsions associated with pregnancy, labour, or the lying-in period eclampsia, but just as in the case of dropsy closer observation and more accurate post-mortem evidence showed that there were several morbid conditions underlying that clinical term, so in the case of eclampsia some believe we have included in it a number of disease entities, each due

¹ THE LANCET, Sept. 21st, 1901, p. 784.