

THE RADIOLOGICAL DEMONSTRATION OF BRONCHIAL CONSTRICTION IN ACUTE ANAPHYLAXIS IN THE GUINEA-PIG

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(With Plate I, containing Figs. 1-6)

IN a classical paper on "The physiology of the immediate reaction of anaphylaxis in the guinea-pig" Auer and Lewis (1910) have shown that the immediate cause of death is asphyxia "produced by a tetanic contraction of the smooth muscles of the bronchioles which occludes their lumen gradually, so that finally no air enters or leaves the lung". They demonstrated this by recording changes in the intrapleural pressure and in the volume of the inspired and expired air during acute anaphylaxis.

The purpose of the experiments to be described was to demonstrate the bronchial constriction by a simpler method. This method consists in the intratracheal injection of lipiodol, which is opaque to X-rays and the taking of X-ray photographs.

METHOD

If the injection is to be made on a living guinea-pig the animal is previously anaesthetised with urethane. The injection is made in the X-ray room where it can be watched through the screen. A small incision is made in the skin just below the larynx and the needle inserted into the trachea. The syringe containing the lipiodol is now attached, the lights switched off and the injection made slowly while watching the flow of fluid through the screen. Thus, the amount given can be controlled by direct observation and photographs can be taken at various stages during the filling of the bronchi and alveoli.

DESCRIPTION OF RESULTS

Pl. I, figs. 1-3 are from photographs that were taken during the injection of lipiodol in anaesthetised normal guinea-pigs. In Fig. 1 the main bronchi and some of the smaller ones are outlined; in Fig. 2 the whole of the bronchial tree is outlined, while in Fig. 3 the lipiodol has entered the alveoli and filled them almost to the margins of the lung. The lipiodol flowed easily and the whole of the alveoli were filled with scarcely any resistance. The photographs shown were taken from three different guinea-pigs. It is possible to show the different stages of filling on the same animal but considerable speed in changing

films is then required as dispersal of the lipiodol throughout the alveoli takes place quickly.

Figs. 4–6 are likewise from photographs that were taken after the intratracheal injection of lipiodol in a guinea-pig dead from acute anaphylaxis. It received an intravenous injection of 0·2 c.c. of horse serum 18 days after the sensitising dose. Typical symptoms of acute anaphylaxis developed and it died 6 min. after the injection. Immediately after death lipiodol was injected intratracheally. More pressure was required to inject the lipiodol to the stage shown in Fig. 4 than would have been required to fill the whole of the alveoli in a normal animal. It will be seen that the two main bronchi terminate in pencil-like points, that lipiodol has entered one smaller bronchus but that the lumen is very narrow as compared with that of the corresponding bronchus in Fig. 2, and that only a few alveoli contain lipiodol. Fig. 5 shows the result when still greater pressure was used, some of the lipiodol began to flow back and fill the oesophagus, a few more alveoli were filled but no more bronchi were opened up by the increased pressure. For Fig. 6 still more pressure was used so that the back pressure filled the oesophagus and lipiodol entered the stomach, the alveoli already opened were overfilled as shown by the increased density of some areas, but no more bronchi were opened. That the lack of filling of the smaller bronchi and alveoli in these experiments was not due to the presence of an air lock in the alveoli was shown by snipping round the margin of the lungs with a pair of scissors, no more lipiodol could be injected than before.

In other cases where lipiodol was injected into the lungs of guinea-pigs dying of acute anaphylaxis the obstruction was more marked than in the case recorded by Figs. 4, 5 and 6. The usual appearance shows the trachea with the two main bronchi, the obstruction being so great that lipiodol cannot be forced into the lesser bronchi.

SUMMARY

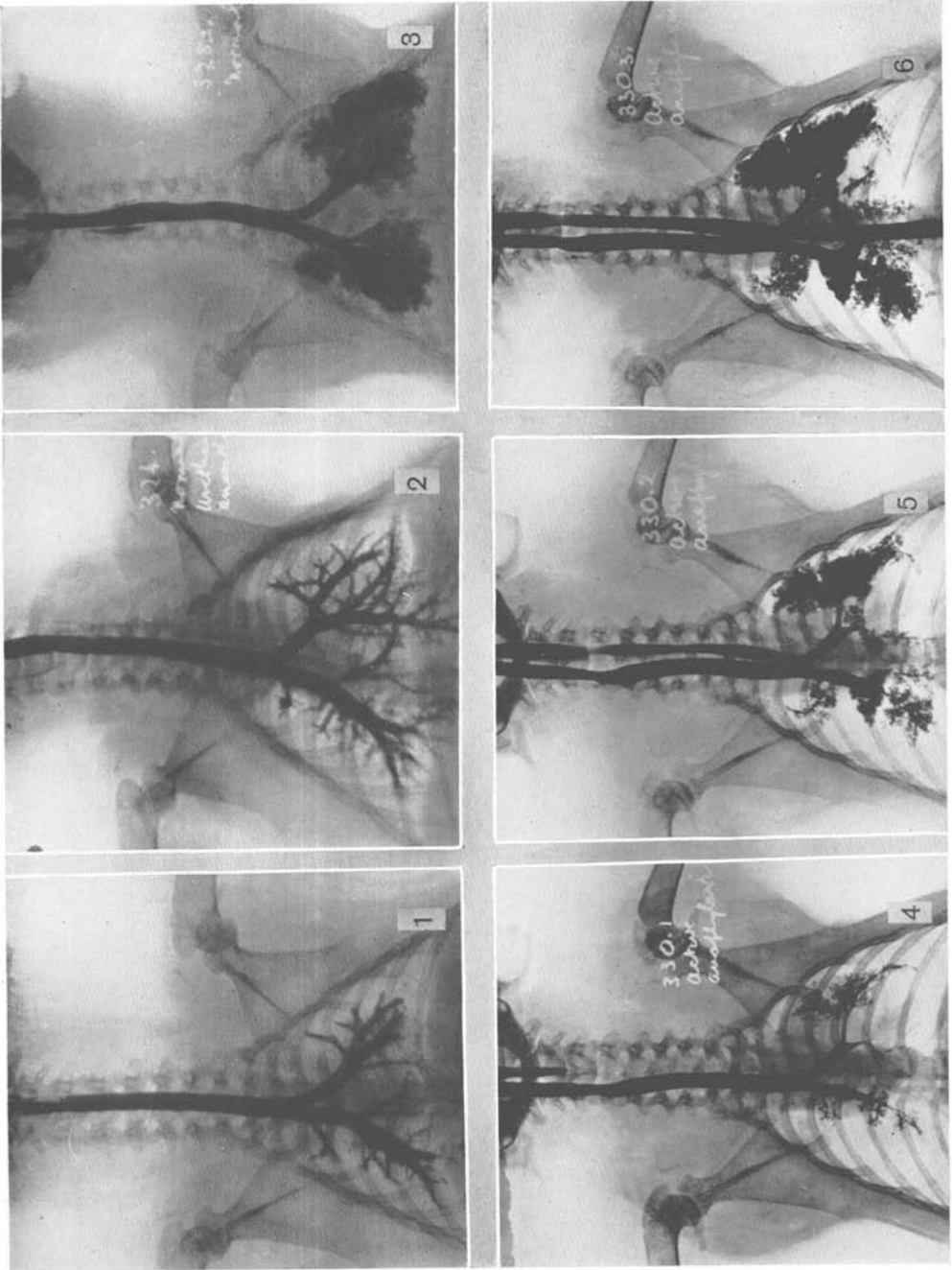
The bronchial constriction occurring in death from acute anaphylaxis has been demonstrated radiologically by the use of lipiodol.

I am indebted to Dr A. E. Barclay for taking the X-ray photographs.

REFERENCE

- AUER, J. and LEWIS, P. A. (1910). *J. Exp. Med.* **12**, 151.

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Illustrating the radiological demonstration of bronchial constriction in acute anaphylaxis in the guinea-pig.