above chronic sinusitis but I was led to investigate the question because for some years I had noted that my glaucoma patients suffered from old nasal disease.

Naturally it will be pointed out that, as catarrhal troubles are so common and glaucoma relatively rare, the former cannot be the cause of the latter. The same argument may be used regarding deafness, but no one considers that catarrhal deafness is primarily an ear disease; infections of the eye and of the ear are practically always secondary. Why these organs become involved in one person but not in another depends principally on individuality, which we cannot analyse, and probably also on the strain of the germ causing the infection. That such involvements do occur is a matter which is much too frequently demonstrated in ordinary experience.

The opposition argument may also be urged. A friend whose opinion must be respected writes that his glaucoma cases show neither symptoms nor x-ray signs of sinusitis. I fear, however, that he has not excluded chronic sinusitis, which is almost always ignored and left unchecked, to cause, usually only after many years, its train of permanent disability.

Nasal treatment and sinus operations, the effects of the various rays and high-frequency currents, of anti-staphylococcus serums and toxoids, and of air-conditioning are beyond the scope of this paper, but compulsory use of

the last as a preventive measure, especially in crowded schoolrooms, should be seriously considered. As the dictum of the surgeon of fifty years ago against operating in chronic glaucoma is still sound, some early and effective treatment of the underlying cause must be found if we are to prevent these most distressing cases.

Conclusion

The cause of glaucoma can only be determined by further systematic observation, but with so many indications all pointing to the same conclusion, with no other probable cause of the disease apparent, and with chronic septic infection established practically in contact with the orbits, surely it is not wise simply to ignore the whole matter. It is about eighty years since the nature of glaucoma was first recognized, yet only last year a paper was read which stated: "We do not know the cause of glaucoma." This may be so, but it is not to the credit of ophthalmology, and an adequately organized attack on this problem under control of a central committee is long overdue.

Residual infection and reinfection must be dealt with by the rhinologist, but the prevalence of disease of the upper air passages and its deleterious effect on the chest, eye, and ear make one recognize that air-conditioning as a preventive measure is as important as the treatment of water.

THE SEDIMENTOMETER

A PHOTOGRAPHIC APPARATUS FOR AUTOMATIC RECORDING OF BLOOD SEDIMENTATION RATE

BY

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Recently the estimation of the blood sedimentation rate has become a popular biological test in the evaluation of the general response of the patient to disease. The technique of the test is easy enough, but the chief objection from a practical standpoint is the time needed in order to obtain the readings. General physicians and practitioners are too busy to do this simple yet reliable test themselves, while in institutions such as sanatoria the medical staff has often to rely on non-qualified observers to take the readings. It is on account of this that the test is usually made as simple as possible, and a single reading at the end of a definite time interval, usually one hour, is the only observation taken. On the other hand, to obtain the maximum information the behaviour of the blood sedimentation should be studied throughout the whole time it is sedimenting. Cutler,¹ who has studied this extensively, reads the sedimentation fall every five minutes throughout an hour, and plots the results on graph paper, plotting the time in minutes along the abscissa and the height of the clear plasma above the sedimenting column of red cells along the ordinate. He has found that the more abnormal the blood rate the more rapid is the fall during the early stages.

The apparatus known as the sedimentometer dispenses with the need for an observer, and at the same time will take an accurate and permanent record throughout as long a period as may be considered necessary. The Cutler tube,² as used at Preston Hall, holds one c.cm. of blood

in a column fifty millimetres high with a relatively wide cross-section. This tube is a very convenient one to use in the sedimentometer.

Photographic Recording

The principle on which the sedimentometer works is simple. If a beam of light passes through a column of sedimenting citrated blood it will be interrupted by the opaque mass of red cells below, but will be readily transmitted through the clear blood plasma above. If a sheet of bromide paper placed behind the tube is exposed to this beam of light and then developed in the usual way, the upper part will come out black, while the part with the opaque red cell layer will be white, since no light can get through. The border between the white and black parts marks the height of the sedimenting column at the time. In order to obtain a continuous record throughout the time the blood is sedimenting, the bromide paper must move past the tube at a slow, even speed. A lens placed between the sedimentation tube and the photographic paper corrects the diffusion of light, and a sharp photograph is obtained; at the same time the millimetre markings on the tube are recorded as white lines on the print. It may be noted that such an instrument

FIG. 1.—Photograph of the sedimentometer.

(Fig. 1) will also produce an enlarged image of the blood column if such is desired. At the present moment a new method is being worked out by which a few drops of blood from a needle-prick can be used to estimate the blood sedimentation rate in a very short and relatively wide-bore tube.

In using the sedimentometer ordinary plate-holders are loaded with bromide paper in the same way as one loads plates in the old-fashioned plate camera. The plate-holder is placed in the cross arm at the back of the sedimentometer, and the slide withdrawn from the plate-holder. The clock which drives the plate across the

central slit in the cross arm is set going. Then the fifty-millimetre Cutler tube filled with citrated blood is placed in the special holder behind the ground-glass window and the exposure begins. At the end of sixty minutes the plate automatically stops so that the sedimentometer can be unloaded at any convenient time. X-ray developer is quite good enough to develop the paper.

Interpretation

After development a picture similar to those illustrated (Figs. 3-6) is obtained. A diagram (Fig. 2) will help in its interpretation. Above is a rough parallelogram ABCD ;

FIG. 2.—Diagrammatic key to the reading of a sedimentation chart obtained from the sedimentometer.

FIG. 3.—Photograph showing a normal sedimentation fall. The sedimentation index (the reading in millimetres at the end of an hour) is 4 mm. The normal index is 2 to 8 mm. for men and 2 to 10 mm. for women.

FIG. 4.—A diagonal line indicating a quiescent lesion ; sedimentation index $11\frac{1}{2}$ mm. If the time interval between starting and shutting off the machine is known the sedimentation reading for intervals greater than one hour can be automatically recorded by measuring the length of the column at the end of the graph—in this case the sedimentometer was not shut off until $1\frac{1}{4}$ hours had elapsed ; thus the reading for $1\frac{1}{4}$ hours is 13½ mm.

FIG. 5.—Diagonal curve graph ; this indicates moderately active disease. Sedimentation index $19\frac{1}{2}$ mm.

FIG. 6.—The vertical curve ; this indicates markedly active disease. Sedimentation index $29\frac{1}{2}$ mm.

this is the space above the fluid level. A wide line CD which is white in the photograph is the meniscus ; the readings are taken from the lower margin of this

line. The dark triangle EDF represents the gradually increasing plasma column, while the white area below that is the unexposed paper protected by the opaque blood column. It will be noted that EDF is broken by a number of horizontal lines, these lines being the actual millimetre markings on the tube. If desired, the sedimentation curve may be copied off on to Cutler charts. For this purpose there is provided a special transparent rule marked off in twelve equal spaces, each space equal to the distance travelled by the plate in five minutes. The sedimentometer can be used in an ordinary room, using artificial light or daylight.

FIG. 7.—The blood sedimentations as registered by the photographs above (Figs. 3, 4, 5, 6) are recorded on the specially printed form, which is a modification of the original Cutler form.

My thanks are due to the Medical Director of Preston Hall for permission to publish this article, to Drs. J. Crawford and A. Ross for their helpful suggestions, and to the original article of H. W. Sulkowitch.³ The instrument is made by Messrs. A. L. Hawkins and Co., Ltd., of 66, New Cavendish Street, W.1, whose co-operation has made possible the actual production of the sedimentometer.

REFERENCES

- ¹ Cutler, J. W.: *Amer. Journ. Med. Sci.*, May, 1932, clxxxiii, 643.
- ² Idem: *Ibid.*, 1926, clxxi, 882.
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Clinical Memoranda

Angioneurotic Oedema of the Larynx, with Sudden Onset of Asphyxia

The following case seems worthy of placing on record. I think it may prove of interest in view of the fact that a Magill's tube could be passed in such a condition, with the result that the patient's life was undoubtedly saved.

A young man aged 22 walked into the hospital one evening complaining of swelling of the lower part of the face, which had spread from a wheal that appeared spontaneously on the right side of the chin. His voice was husky and feeble, and he had some slight difficulty in breathing. When examined in bed he appeared to be quite comfortable, but was unable to give any useful account of his condition owing to almost complete loss of voice.

The swelling, which involved the whole of the lower jaw, especially the lower lip and to a lesser extent the throat above the level of the thyroid cartilage, was obviously due to oedema. No point of infection could be discovered, so that a diagnosis of angioneurotic oedema was made, and the patient was given four minims of adrenaline subcutaneously.

He appeared to be somewhat better until 9 p.m., when he had a sudden increase in respiratory difficulty. Three minutes later the patient suddenly leaped out of his bed, clutching his throat, and staggered across the ward, to fall asphyxiated into the arms of an attendant. He was then unconscious, black in the face, and almost pulseless.