steadily losing ground. On the last examination of the chest physical signs were found on auscultation at the left apex, leaving no doubt about that side being affected, a fact which the x rays had shown to be the case some weeks previously.

Harley-street, W.

Clinical Notes:

MEDICAL, SURGICAL, OBSTETRICAL, AND THERAPEUTICAL.

THE OPTICAL EFFECT OF REMOVAL OF THE LENS IN MYOPIA.

By W. ADAMS FROST, F.R.C.S. ENG.,

OPHTHALMIC SURGEON TO ST. GEORGE'S HOSPITAL, ETC.

In deciding whether a particular case of myopia is likely to be benefited by removal of the lens the optical effect of the operation is so important a factor that it is a pity that there should be any misconception with regard to it. A great many inaccurate and misleading statements have, however, been made by writers on this subject, while many either ignore this branch of it, or treat it by means of mathematical formulæ which are rather alarming to the average reader. The only points which are of practical importance can be made clear without any abstruse calculations, especially if we are careful not to confound two different things—the effect of the operation on the actual refraction of the eye and its effect on the correcting lens required.

With regard to the refraction if we confine the term to the influence exerted by the refracting surfaces and media of the eye on rays entering it it is evident that if the lens has the same value in all cases and lies in the same position relative to the cornea—and there is no evidence that myopia has any influence on either of these conditions—then the effect on the refraction of removing the lens must be the same in all cases.

When we consider the effect of the operation on the correcting lens required for the myopia we introduce another factor, the length of the eye, or the position of the screen on which it is required to throw images of external objects. It is a well-known fact that in the complete eye every millimetre of difference in length produces about 3 D. of myopia or hypermetropia, but when we remove the crystalline lens we alter the character of the eye as an optical instrument and make it a much weaker instrument than it was before. Consequently, changes in its length produce less effect, each millimetre of length now corresponding to only 1.38 D. We may indeed compare the complete eye and the aphakic eye to the high and low powers of a microscope. With the high power (corresponding to the complete eye) a fraction of a turn of the fine adjustment will make an appreciable difference, while with the low power (corresponding to the aphakic eye) several turns would be required to produce the same effect. The length of the emmetropic eye is about 23 millimetres, but the emmetropic length of the aphakic eye is about 31 millimetres—the focal length of the cornea. Therefore abnormalities in length are calculated from different standards in the complete and in the aphakic eye, the difference being eight millimetres.

The practical effect of these facts will be rendered clear by a few examples. 1. Myopia 15 D.—The eye is therefore five millimetres too long. After removal of the lens the length would have to be eight millimetres more than the emmetropic eye. It is only five millimetres, therefore the eye is three millimetres too short and for correction it would require + 4 D. (3×1.38). 2. Myopia 24 D.—The eye is therefore eight millimetres too long, but after removal of its lens the length will be exactly right. 3. Myopia 30 D.—The eye is therefore 10 millimetres too long. After removal of the lens it will be two millimetres too long ($10 - 8$), therefore it will require for correction 2.75 D. (2×1.38). It will be seen that the optical effect of the operation as regards the myopia in the first example is 19 D. (the difference between -15 and +4). In the second the effect is 24 D., and in the third the effect is 28 D. ($30 - 2$). In other words, the

greater the degree of the myopia the more it is affected by the operation.

It must be borne in mind that I have not used exact figures and consequently the results do not agree with those found in actual practice but they correspond fairly closely.

Cavendish-square.

HEMORRHAGE DURING AN OPERATION FOR CONVERGENT STRABISMUS.

By MARY R. WILSON, M.D. CORNELL, U.S.A.

DIVISION of a rectus muscle for the relief of strabismus is rarely associated with, or followed by, any complication. The following case in which rather alarming bleeding was observed is perhaps sufficiently uncommon to be recorded in the pages of THE LANCET. The patient was under the care of Mr. Sydney Stephenson, by whose kindness I am enabled to publish the notes.

A girl, aged 11 years, was admitted to the Ophthalmic School at Hanwell on Feb. 9th, 1899, suffering from sub-acute inflammation of the conjunctiva due to the diplo-bacilli described by Morax.¹ She also had a convergent strabismus of the left eye measuring nearly 50°. The squinting eye "fixed" fairly well and showed no limitation of outward movement, and the primary and secondary deviations were equal. At this time right vision equalled $\frac{1}{3}$ and No. 4 J. at 12 centimetres, and left vision equalled $\frac{5}{6}$ and No. 10 J. at 27 centimetres. When under atropine the eye tended to become straight, yet, curiously enough, correction spectacles (right eye + 6 D. sph.; left eye + 7 D. sph.) did not influence the size of the strabismus in the least. Corrected vision equalled $\frac{5}{6}$ for each eye. No diplopia could be detected and the fundi were normal. On April 3rd it was decided to operate for the strabismus. The child, it was thought, would bear the operation well if the eye were put under the influence of a solution of hydrochlorate of cocaine (2 per cent.). She proved, however, so exceedingly refractory that division of the internal rectus of the squinting eye was accomplished with difficulty. The moment the operation appeared to be completed, a jet of what seemed to be arterial blood issued from the conjunctival wound, and in the course of a few seconds the eyeball became thrust forward and the lids so greatly thickened by the effusion of blood in their tissues that removal of the speculum was a difficult matter. A pad and roller bandage were firmly applied and the child was put to bed immediately. Two and a half hours later the eye was examined, when the lids were found to be much distended, the upper one being purplish and the lower one of a light-greenish colour. There had been some pain which, it was said, had disappeared. The temperature was normal. On April 4th the lids were swollen so much that they could not be opened, while the swelling had extended to the side of the face. The lids were greatly discoloured, the upper one especially, but there was no pain. The temperature rose to 99° F., the highest point reached during the continuance of the trouble. The eye was kept firmly bandaged. Two days later (April 6th) the temperature was again normal and there was no pain. The discolouration and swelling of the lids persisted but the latter were slightly opened with little difficulty. The cornea was bright and the child counted fingers. The eyeball was still proptosed, but not markedly, while the swelling had not disappeared from the side of the face. The movements of the eye in the orbit were good. The pad and bandage were re-applied. By the 8th the left eye was better in every way but a new feature presented: ecchymosis had passed through the cellular tissue of the bridge of the nose and extended to the right eye. On the 10th the child was able to open the lids of the left eye a little and although there was much effusion of blood beneath the ocular conjunctiva there was neither pain nor uneasiness. On the 13th the child could open the lids of the left eye. Much ecchymosis existed but the lids could be everted. Ecchymosis was present also on the right side of the nose and the lower lid of the right eye. A fortnight later, on the 26th, a faint discolouration of the skin of the lids, side of the nose, and left cheek still persisted. There was also a bright red ecchymosis in the ocular conjunctiva on the outer side of the globe near the corneal margin and the discolouration had not disappeared from the lower lid.

¹ Annales de l'Institut Pasteur, 1896.