

- MAX, CLARA.—Das Nervensystem des Menschen. Barth, Leipzig. 1942.
 ELSCHNIG.—Versammlung in Heidelberg. 1907.
 FÜCHS, E.—Lamina Cribrosa. *Graefe Arch. f. Ophthalm.*, Vol. XCI, p. 435, 1916.
 FISCHER, A.—Lehrbuch der Entwicklung des Menschen. Springer. 1929.
 HENKE-LUBARSCH.—*Handbuch d. spez. Path. Anat. u. Histol. d. Menschen.* 1928.
 KLECZKOWSKI, T.—Badania nad rozwojem nerwu wzrokowego. Kraków. Rócznik Lekarski T.III. 1913.
 KOLMER-LAUBER.—*Handbuch d. Mikroskop. Anat. d. Menschen.* 1936.
 SÄTTLER, H.—Ueber die Markscheidenentwicklung in Tractus Opticus. *Graefe Arch. f. Ophthalm.*, Vol. XC, p. 271, 1915.
 SCHIECK-BRÜCKNER.—*Kurz. Handbuch. d. Ophthalm.*, 1930-1931.
 SEEFELDER, R.—*Beiträge zur Histogen. u. Histolog. d. Netzhaut, Graefe Arch. f. Ophthalm.*, Vol. LXXIII, p. 419, 1910.
 V. SZILY, A.—*Graefe Arch. f. Ophthalm.*, Vol. CVI, p. 195, 1921; Vol. CVII, p. 317, 1922; Vol. CIX, p. 3, 1922.
 WILBRAND-SAENGER.—*Handbuch. d. Neurolog. d. Auges.* 1909.

CONTACT LENSES *†

BY

IDA MANN

OXFORD

To us all here the subject of contact lenses is an interesting one and the foundation of a society for the scientific study of the problems connected with them needs no apology, but we are far from being a representative gathering. You will realise this when I tell you that only a short time ago an eminent scientist said to me "Why waste your time starting a contact lens society?" I replied "Why is it a waste of time?" and received the devastating answer, "Because everything is known about them. Optically they provide a beautiful answer to many problems and practically they are useless, as no one can wear them for more than an hour and a half." I think we can say that this statement is largely untrue. In the first place, I hope to show in this address that we certainly do not know all about them and, secondly, I think no one here will dispute the fact that some people cannot even wear them for an hour and a half, while others notice no discomfort after ten times as long.

There would, therefore, seem to be good reason for a society for their study, even though so much has already been written on them and so many experiments performed. These experiments differ from the usual scientific experiment in that they have practically all had to be done on man. Animal experiment will not give us any of the answers we seek, since obviously we cannot test visual acuity in

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an animal, nor can we enquire as to tolerance. Even gross experiments on corneal physiology are hardly applicable, the relative sizes of cornea and sclera differing between man and most other animals, as also does the anatomy of the limbus. We are, therefore, handicapped from the beginning by the introduction of innumerable variables (*e.g.*, of physiology, of pathology and of psychology) into each individual experiment and it is small wonder that, more than a hundred years after Thomas Young's original paper in the *Philosophical Transactions*, our knowledge is scanty and our chances of success in a given case still unpredictable. It should be the object of this society to formulate the problems which confront us and by the careful accumulation of accurate data to attempt to solve them.

It is obvious that our problems fall into two groups, those of optics and haptics. The former are not formidable and I do not propose to deal with them in detail, though you will all realise that much still remains to be done if we are to reach an optical accuracy comparable to that obtained with spectacle lenses. We have by no means mastered the problems of the introduction of prisms and of cylinders into contact lenses, nor are we very near the production of a bifocal contact lens. We are not even certain of the best material of which to make contact lenses, nor even whether that material yet exists. There is, therefore, room for collaboration with the physicist, the technician and the chemist.

The more pressing problems, however, are those concerned with tolerance. My own interest in the subject is purely clinical, and I have been ordering contact lenses more or less hopefully for the last ten years. Recently I realised that I knew very little about the results I had obtained and through the kindness of one of our secretaries, Mr. Cross, I was able to obtain a fair follow-up of 100 of my cases. This has been most illuminating, and has helped me to formulate some of our problems. All my cases were individually fitted, some of them after having tried Zeiss lenses with no success. In practically all of them contact lenses gave a better visual acuity than spectacles and were ordered for this reason. (I did not, in this follow-up, include cases with active pathological conditions necessitating contact lenses as part of treatment). The patients therefore had an incentive to persevere. Of the hundred patients, 61 were myopes, of whom 11 only wore -5.0 D.Sph. lens or under, the rest having very high corrections, up to -22 . The patients wore a single lens only, for monocular aphakia. Eleven had conical corneae and the remainder suffered from various disabilities, including high hypermetropia, binocular aphakia, corneal scars and dystrophies.

There were 46 males and 54 females and their ages ranged from 14 to 73 years. The majority were between 30 and 40 years old.

These patients were all asked whether, knowing what they now

know, they would go in for contact lenses again. Sixty-four replied unhesitatingly Yes, 19 gave an equally emphatic No, while 17 considered that certain improvements ought to be possible to make them comfortable and if these were done they would answer Yes. Can we discover any relationship between the tolerance and intolerance of these patients and either their ocular condition or their habits of wear? In the first place, must the lens be worn every day for tolerance to be good? Fifty-five patients wore their lenses every day and 47 of these had tolerance good enough to permit a full day's work in the lenses, 31 of them wearing them for more than 12 hours every day. The remaining eight (of the 55) had poor tolerance of less than six hours. On the other hand, nine patients who only wore their lenses occasionally had excellent tolerance also, so that regular wear is not proved to be essential. Most of the patients, however, who only wore their lenses occasionally had poor tolerance and gave this as a reason for not wearing them. Twenty-three of the 100 patients did not wear their lenses at all, but this was not always because of intolerance. In one case the patient's fingers were too rheumatic to manipulate the lens, in two cases a very dirty job was being done and they feared to put their dirty fingers near their eyes, in three others there was nervousness of the lens, but in many there was extreme intolerance.

Can we show that intolerance is associated with any special condition of the eye? If we consider the myopes we find that of the 61 questioned, 31 wore their lenses for more than eight hours every day, 16 wore them every day, but for less than eight hours, while 14 did not wear them at all and 10 of these 14 were high myopes who had much to gain visually. It does not therefore appear possible to relate tolerance to the presence or degree of myopia.

On the other hand, there does appear to be a correlation in the case of conical cornea, though the numbers are small. Of the 11 patients fitted, nine wore their lenses all day with success, and two could only wear them part of the day. None was a complete failure.

Monocular aphakia, though theoretically a good indication for contact lenses, does not in my series justify itself. Only two out of 10 patients wore their lens at all and one of these has now given it up. The remaining eight all complained of diplopia.

Of the cases with various corneal conditions, only four or five had really good results, but this series is small and not homogeneous.

We therefore require more data on the type of condition suitable for contact lenses and it might well be that a correlation with tolerance is not possible.

Eighty-four of the patients replied, when asked whether they inserted their lenses dry or used a solution. Much has been written



and many theories advanced about the necessity for a solution and its ideal composition. The results in my series are surprising and show that much more work is needed and that theorising is unsatisfactory. Of these 84, 49 inserted their lenses dry and 23 of these had a tolerance of more than eight hours (often 14 to 16 hours); eight of the 49 had tolerance of four to eight hours and 10 of from two to four hours. Eight could not wear a lens at all. Twenty-two patients used normal saline. Seven of them had more than eight hours tolerance, eight of them four to eight hours, four of them two to four hours and three could not wear the lens.

The third group is, however, the most interesting. Thirteen patients had obviously experimented and with surprising results. One with 16 to 18 hours wear every day always puts his lens in his mouth before inserting it, one with eighteen hours used distilled water, as did another with very poor tolerance. One used boracic lotion and wore the lens six hours, nine used tap water and all had tolerance of eight to sixteen hours. We have obviously a lot to learn and unlearn about solutions.

What reasons were given for intolerance? In many the corneal veil was the most trouble and this was too variable for generalisation, coming on sometimes in half-an-hour, sometimes in 14 hours. In other cases pricking of the lids, smarting, grittiness, discharge, headache and many other symptoms were noted, and here we have our greatest problem. The problem of the veil is basically a physiological one and will probably be solved by some modification of fit, as is being shown by Dallos' experiments with holes and slits in the lens. But there are other problems connected with the state of the lids and the presence or absence of low grade infections. A whole series of experiments awaits an investigator here, many even applicable to animals. We have no idea of the alterations of the normal bacteriological flora of the eyes produced by contact lenses. Indeed, the surprising thing is the high local immunity of the conjunctiva and the rarity of serious infection. Low grade infection may be common; we do not know. It may account for sensations in the lids and for the accumulation of sticky secretion complained of by some patients.

So far, you will note, I have not touched on the question of fit at all and yet have raised a number of unanswered questions.

I will leave it to our next speaker to attempt to clarify our ideas on the problems of shape, size and fit, and will be content to close this very incomplete list of unanswered queries with a plea for the accumulation of more data and the planning of further experiments. I trust I have justified my contention that the scientific study of contact lenses is not a waste of time.