

eye with very imperfect vision may resent the change in the size of its retinal images, as the following illustrates:

CASE 3.—Mrs. A., aged 23, had been successfully operated on when 5 years of age, for convergent squint. Binocular vision could not be demonstrated by any of the ordinary tests. She came for eye-strain. She was wearing, R.+4 sph. and L.+3.75 sph. \ominus 1 cyl., ax. horizontal. The full correction and vision obtained were:

R.—4 sph., V= counting fingers at 8 feet.

L.—+4.25 \ominus 2 cyl., ax. 165°. V=4/4, mostly.

Without lenses the right eye could only count fingers at three feet. It had no central scotoma, but vision seemed relatively better in the periphery of the field. I ordered correcting lenses. She returned in a week saying that she could not wear them. I reduced the lenses before the right eye to -0.75 sph. She tried these three weeks and returned with the statement that she "could not stand them." She still saw outlines of large objects doubled. I now gave her +4 sph. for the right eye, the left remaining unchanged throughout, and the glasses were perfectly satisfactory.

In contrast with the above is the following:

CASE 4.—Mrs. K., aged 33, had known that the left eye was defective for many years, and lately the right had started to ache. Her correcting lenses and vision were:

R.—+1 sph. \ominus 0.25 cyl., ax. 85°=4/3, partly.

L.—+6 sph. \ominus 3.50 cyl., ax. 180°=4/30.

This patient had been wearing right and left +0.25 sph. for several months. She had binocular fusion with right hyperphoria, 2 centrads, and exophoria of about the same amount. A short trial of the two correcting lenses seemed to cause no marked inconvenience from distortion of objects. I ordered the full correction for each eye for constant use. Four months later she said: "At first I feared they would not suit. Now I don't know what I could do without them."

Patients with very high myopia are rather likely to stand the correction of high anisometropia without excessive inconvenience from it.

CASE 5.—Mrs. R., aged 31, near-sighted from childhood, had worn R. and L.—9. For eight years she saw very imperfectly with them, and had recurring styes. Her correcting lenses and the vision they gave were:

R.—14 sph. \ominus 2.50 cyl., ax. 15°=4/9, partly.

L.—20 sph. \ominus 2 cyl., ax. 180°=4/20.

Her power of accommodation was about 8 D., and trial of the lenses caused no inconvenience. I ordered the full correction for both eyes. No great difficulty was experienced with them, and four months later she reported she was "rid of styes entirely," and "if the eyes stay like they are I will be well satisfied."

In a larger portion of cases, however, the ultimate complete correction of high anisometropia is better reached by the wearing for a time of partial corrections; as in the following:

CASE 6.—Mrs. A., aged 27, highly myopic, with marked choroidal changes and recurring styes, was found to require:

R.—10 \ominus 1 cyl., ax. 15°. V=4/6.

L.—4 \ominus 1.25 cyl., ax. 180°. V=4/5, mostly.

She was given the full correction in the left eye and at first

R.—7 \ominus 1 cyl., ax. 15°.

At the end of seven months the right lens was changed to -9 \ominus 1 cyl., ax. 15°.

And six months after that, the full correction for the right eye was given.

The above cases illustrate the points of most importance regarding the management of cases of high anisometropia. Every case must be a subject of careful individual study; and the selection of a lens for the worse eye, at first somewhat tentative. But our efforts may be directed very definitely toward certain objects.

In a few cases capable of nearly equally acute vision in both eyes, the more hyperopic or less myopic eye should have its correcting lens, to fit it for distant vision; and the other eye, the lens which will adapt it for vision at about one-third of a meter.

In other cases the object should be the full optical correction in each eye, to be attained either immediately or by successive increments, in the strength of the lens for the more ametropic eye.

In rare cases we must be content with the full correction of the better eye; and the adjustment to the other of the lens that will enable it to give most aid in binocular vision.

In anisometropia, the placing of the lenses closer to the eye lessens the annoyance caused by differences between them, because the nearer the lens is to the eye, the less it affects the nodal points of the dioptric system, and the size of the retinal image.

In rare cases of very high myopia in one eye with the other eye but slightly myopic or hyperopic, the removal of the crystalline lens from the myopic eye would be proper. I have advised such a procedure in two cases, but neither of these patients thought the probable benefit worth the trouble and risk. The difference in the refraction of the two eyes necessary to justify this measure is not less than 12 D. If corneal incision ever comes into practical use to modify high astigmatism, it will first be proper to apply it in cases of high anisometropia.

[Discussion next week with other papers of the symposium.]

ASTIGMATISM AFTER CATARACT EXTRACTION.*

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The perfection attained in modern operative methods warrants the assertion that with reasonable self-control on the part of the patient and thorough aseptic precautions both during the operation and after the treatment, the results of correctly performed extractions of mature, uncomplicated, senile cataract should be fairly uniform, and the patient's vision should very nearly approximate 20/20.

To the astigmatism, which so frequently results from cataract extraction, is often due our failure to obtain this perfect result. If the degree is high, even though it be regular, it is sometimes impossible by means of any glass to correct it in such a manner as to obtain full vision and, even where central vision of 20/20 is obtained by the aid of strong cylindrical lenses, such lenses are well known to have some serious disadvantages in general use, not the least of which is the necessity for great care in keeping them accurately adjusted to the one position before the eye in which good vision may be obtained.

It is extremely desirable, therefore, in order in some measure to avoid operative astigmatism, that we should understand its nature and those influences which tend to produce it.

A number of valuable contributions to our knowledge of post-operative astigmatism have been made from time to time, and while, perhaps, nothing original may be added, it is my object in the present paper to briefly present the results of a study of a series of my own cases compared with those of others and a summary of the deductions of greatest importance to the practical operator which may be warranted by the present state of our knowledge of the subject.

It is capable of demonstration by measurements with Javal's ophthalmometer that an incision of such size as is required for the extraction of cataract will generally be followed by a diminution of curvature in the meridian at right-angles to the incision and in many instances, what is often lost sight of, a less marked increase in that of the opposite meridian.

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The conditions which influence the production of operative astigmatism may be grouped as follows: 1. The form and location of the incision. 2. The nature of the healing process. 3. The degree of tension from within or pressure from without, which may influence this healing process.

An incision at right angles to the surface of the cornea would probably be an ideal one so far as astigmatism is concerned, but in an operation so complex as the extraction of cataract, it is a grave error to be so far a slave to a single idea as to sacrifice general results to our theories on some one point in the operative procedure, however important that point may be, and in the selection of an incision there are greater evils to be avoided than the production of astigmatism, even though a moderate degree should be permanent. Were this not the case we would probably, for the sake of avoiding astigmatism, adopt Graefe's long since abandoned, peripheral-linear incision.

To avoid loss of vitreous, iridocyclitis and, if performing simple extraction, prolapse of the iris, is a consideration of vastly greater importance than the production of a few diopters of astigmatism, but if the latter may, in some measure, be avoided by modifying our incision without sacrificing points of more serious importance it is well to do so.

The writer has found his best results follow an incision which begins in the extreme margin of the transparent corneal tissue, follows the corneal margin until within about 1.5 mm. of the summit and then turns forward and emerges with the knife in the plane of a great circle. This incision is not, in my judgment, so frequently followed by iris prolapse as one completed in the periphery, but whether it is always less apt to be followed by astigmatism I have not made a sufficient number of accurate measurements to determine. Indeed, my results would suggest that possibly this form of incision may be a little more prone to cause astigmatism than others.

On the nature of the healing process much depends as to the degree of the resulting astigmatism. In all cases the interposition of new tissue in the wound caused by displacement of the flap must lead to alteration of curvature; and retarded healing from restlessness on the part of the patient, undue movement of the eyes and inflammatory reaction causes swelling of the corneal tissue and consequent displacement.

Conditions within the eye, which favor increase of the intraocular contents, whether due to previously established disease or irritation accompanying the operative traumatism, continually tend to reopening of the wound and consequent increase in the astigmatism; and this brings us to the consideration of the influence exercised by the iris in causing or preventing astigmatism and the advantages or disadvantages of an iridectomy prior to or at the time of the extraction of the lens.

Here, as in the selection of the form of the corneal incision, so many other and weightier considerations must be taken into account that the question of the production of a little more or less astigmatism seems of relatively slight importance, but while it is with special reference to the causation of astigmatism that we are now considering the question, it is well to remember that whatever operative method or mode of after-treatment succeeds best in preventing reopening of the corneal wound tends to prevent infection and iritic exudation in the pupillary space as well as permanent astigmatism.

It is like touching on one's religious or political creed

to open up the subject of simple or combined extraction with an ophthalmic surgeon and, if we will be entirely frank, most of us must, with the religionist and the partisan, acknowledge the existence of a shade of bigotry or prejudice which leads us to look somewhat askance on methods which differ greatly from the one which in our hands has proven most satisfactory. Even in some of our best text-books this subject is dealt with in a manner to make more strongly manifest the writer's qualifications as a partisan than as a scientist, and the author's own method is often insisted on as the only true one.

After careful study of a long series of my own cases, with their visual results, I was led a short time since to make some comparisons with the results obtained by others who operate by a different method, and the fact that, so far as the production of astigmatism is concerned, their results were sometimes better than my own has led me of late to investigate the subject still further.

For many years, when no unusual condition has rendered such a course impracticable, it has been my practice to perform simple extraction, carefully irrigating the anterior chamber with a sterilized 3 per cent. salt solution by means of a simple pipette or Andrews' dropper. The visual results obtained by this method have been excellent and compare favorably with the statistics of other operators, but for some time I have suspected that the degree of astigmatism resulting was higher than it should be.

Prolapse of the iris may cause regular and, at times, irregular astigmatism, and is undoubtedly one of the disadvantages against which we must take precautions in simple extraction but, while under favorable conditions it does occur, this has not been very frequently the case in my experience and, unless the hernia is large, the resulting vision is often excellent. I am convinced that years ago when I systematically performed an iridectomy I had at least as much trouble from prolapse of vitreous and shreds of capsule in the wound as I have had from prolapse of iris since I have adopted simple extraction.

There is, however, a tendency in many cases for the iris to become slightly incarcerated or, more frequently, pressed forward and adherent to the posterior lip of the wound over more or less of its extent. This is not infrequently found in cases with excellent vision and, so far as the safety of the eye is concerned, has not seemed to be a serious matter, even, as I have been led to believe, sometimes acting as a conservative measure. But while it is not, perhaps, a matter of positive demonstration, it is very probable that at times the corneal astigmatism which makes its appearance after simple extraction may be traced to the bulging forward of the lips of the wound owing to the fact that the adherent iris prevents free escape of aqueous, when other causes have produced undue intraocular tension.

It is claimed that an iridectomy involving the excision of only a very small portion of the pupillary margin will, in addition to facilitating the removal of cortical substance, strongly tend to prevent prolapse and adhesions of the iris to the wound by allowing the aqueous to escape when the tension increases, and whether this claim has been fully established or not, it is certainly worthy of careful consideration, and a study of the tables presented below tends to convince one that the operation with a preliminary iridectomy, even though it be small, is apt, for some reason, to be followed by far less post-operative astigmatism.

It is possible that iridectomy prevents astigmatism by allowing the cortical lens substance to be more thoroughly removed and thus avoids such tension as might arise from irritation due to that cause; but in some cases in which I have performed simple extraction and by deliberate manipulation with repeated irrigation have cleansed the aqueous chamber so thoroughly as to see no further evidence of retained cortical substance during the healing process, I have still had astigmatism of considerable degree which was associated with adhesion of the peripheral portion of the iris to the surface of the cornea over a portion of the posterior lip of the wound.

If one might have an opportunity at frequent intervals to see the patients on whom he has operated, and make a careful study of the changes which take place in each case, much might be learned that would be of great interest to the operator. In a recent instance I had this opportunity, and the study of the variations of corneal curvature was very instructive. I quote it, not as bringing out any new point, but as a fair illustration of what we would probably find in many other cases could we see them at frequent intervals.

Paul J., aged 53, a watchmaker, consulted me on Sept. 1, 1898, with senile cataract, incipient in the left, and almost mature in the right eye, which he stated had never been as good as the left.

His vision was:

R. = Fingers at 1 foot.

L. = $5/22.3 + 2 \text{ cyl.}$, ax. $180^\circ = 5/12$ —

By Jan. 18, 1899, his vision in the left eye was so defective as to make it impossible for him to continue his work, and he decided to enter the hospital. Jan. 26, 1899, I operated on the right eye by simple extraction, irrigating the anterior chamber and obtaining an apparently good, primary result, but later I observed a small amount of cortical substance and capsule remaining in the superior, temporal quadrant of the pupillary space, and, owing as it appeared to slight traumatism inflicted by the patient, a moderate amount of iritis developed which yielded gradually to atropia and hot fomentations.

The incision was of the form described above, the knife following the sclerocorneal margin until about 1.5—2 mm. from the summit, and then turning well forward and emerging in a plane perpendicular to the surface. At the end of eighteen days there remained slight injection of the bulbar conjunctiva and the wound presented a narrow cicatricial line with its inferior lip very slightly more elevated than the superior.

The following table will illustrate the variations in the corneal astigmatism, which may be taken as typical of what would be found in a large proportion of smooth, upward, corneal sections for the removal of cataract.

CASE OF PAUL J. ILLUSTRATING THE CHANGES TAKING PLACE IN THE CORNEAL CURVATURE DURING THE HEALING PROCESS AFTER SIMPLE EXTRACTION OF CATARACT.

Eight days before op. Jan. 18, 1899.	Right Eye.		Astigmatism 25 axis 120°	Vision. Fing. at 1'
	Hor. 25	Vert. 24.75		
Jan. 26, 1899, I operated	27.25	22.25	5. axis 180°	+9. \odot +4. ax. $180^\circ = 5/12$
Feb. 13, 1899, 18 days..	27.75	22.	5.75 " 180°	+9. \odot +3. " $180^\circ = 5/5$
Feb. 17, 1899, 22 days..	27.75	22.	5.25 " 180°	+8.5 \odot +3. " $180^\circ = 5/7$
Feb. 20, 1899, 25 days..	27.25	22.	5. " 180°	+8.5 \odot +3. " $180^\circ = 5/7$
Feb. 23, 1899, 28 days..	26.75	22.75	4. " 180°	+8.5 \odot +3. " $180^\circ = 5/7$
Feb. 27, 1899, 32 days..	26.75	23.	3.75 " 10°	+8.5 \odot +3. " $180^\circ = 5/7$
March 3, 1899, 36 days..	26.5	23.	3.5 " $5^\circ - 10^\circ$	+8.5 \odot +3. " $180^\circ = 5/5$
March 10, 1899, 43 days..	26.5	23.5+	3. " 5°	+9. \odot +2. " $180^\circ = 5/5$
March 14, 1899, 47 days..	26.25	23.5+	2.75 " 5°	+9. \odot +2.5 " $180^\circ = 5/5$
March 22, 1899, 55 days..	26.25	23.5	2.75 " 5°	+9.5 \odot +2. " $180^\circ = 5/4$
March 29, 1899, 62 days..	26.	23.5	2.5 " 10°	+9. \odot +2. " $5^\circ = 5/4$

From the above it will be seen that the horizontal meridian, which before the operation had a curvature equivalent to about 25 D., increased after the operation to 27.75 D., while the vertical meridian, which before the operation had about 24.75 D., was reduced by flattening to 22 D., a difference of 2.75 D. in each meridian.

It will further be seen that as the healing process progressed there was a constant tendency to decrease in the curvature of the horizontal and increase in the vertical meridian and at about the same rate, so that at the end of sixty-two days the horizontal meridian had a curvature of 26 D., or 1 D. more than before the operation, while the vertical had a curvature of 23.5 D., or 1.25 D. less than before the operation.

It will also be seen that for some four weeks after the operation there was a marked discrepancy between the astigmatism as measured by the ophthalmometer of Javal and the correcting cylindrical lens, but that as the cornea approximated its normal curvature this discrepancy disappeared and the accepted lens corresponded almost exactly with the finding of the ophthalmometer.

It will still further be noted that from the highest to the lowest degree of corneal curvature it was possible to obtain vision of 5/5, and that, while the corneal astigmatism varied from 5.75 D. to 2.5 D., the accepted lens, after the capsule had cleared and the cortical substance had been absorbed to such a degree as to make it possible to obtain 5/5 vision, varied only from 3 D. to 2 D.

Theoretically one would suppose that the presence of a fairly firm secondary pupillary membrane, if there were in it band-like fibers, would tend to produce an increase in the corneal curvature in the direction of such bands, and I had on several occasions made an especial effort to compare the degree of astigmatism before, with that found after a secondary operation, without being able to recognize any appreciable difference, but, a short time ago in one instance, that of Mrs. Flora M.—not included in the following list because her primary vision was only 20/100—I found positive proof that a secondary, cicatricial band may maintain a degree of corneal curvature which will disappear when the membrane is divided.

Since the following table was taken from my case records, I performed a discission in this case and, on dividing a fairly firm, secondary band which lay in the horizontal meridian, I observed that as it broke there was such a separation as to indicate that it had been acting as a bow-string maintaining the convexity of the corneal arch, and on measuring the corneal curvature, I found it had diminished by 1.25 D.

Thirty-one days after her primary operation the ophthalmometer of Javal revealed astigmatism equal to 11.5 D., ax. 15° . On March 27, 1899, fifteen months later, Javal revealed:

R. E. = 15° 29 D. L. E. = no astigmatism
105° 22.5 D.

Total astigmatism.. 6.5 D.

On March 28, 1899, I performed a discission of R.E. and preliminary iridectomy of L. E.

April 5, 1899, eight days after the discission:

R. E. = 15° 27.75 D. L. E. = 15° 25.5 D.
105° 22.5 D. 105° 25 D.

Total astigmatism.. 6.5 D.

.5 D.

As compared with 6.5 D. before discission.

While it is only very infrequently the case that the cause of post-operative astigmatism may be found in conditions not dependent on the form or position of the

wound or the character of its healing process, this case is interesting because it illustrates the possibility of the secondary membrane producing astigmatism by maintaining the convexity of one meridian of the cornea as a bow-string maintains the convexity of a bow.

In a study of the literature at my command I have found that few of those who have published the results of their cataract extractions have included in their tables a report of the refraction, or ophthalmometric observations, and it has therefore not been possible to compare the degree of astigmatism as obtained by the various methods of operation and after-treatment in as large a number of cases as would be desirable, but the tables presented below will be of some interest.

In order to determine how far the presence of the iris is responsible for the production of post-operative astigmatism, and to what degree asymmetry of the cornea

deliver the lens. By this means it is often possible to remove not only the detached portion of the anterior capsule but a considerable portion of the soft lens substance without incurring serious risk of loss of vitreous, and in these instances, after this preliminary irrigation, the nucleus is easily delivered and any remaining fragments of cortex are removed by gentle pressure aided by repeated irrigation.

In the arrangement of the following tables I have, for the sake of comparison, adopted a form similar to that employed by Pfingst in: "Corneal Measurements After the Extraction of Cataract."²

A SERIES OF 30 CASES WITH VISION = 20/40 OR BETTER, TAKEN FROM THE RECORDS OF DR. J. A. LIPPINCOTT.

- 1.—Mrs. M. S., astigmatism two weeks after operation 1. ax. 180 = 20/40; five weeks after operation, 1. ax. 180 = 20/30.
- 2.—A. R., astigmatism three weeks after operation 7. ax. 180 = 20/30; six weeks after operation, 3. ax. 180 = 20/30.

A SERIES OF THIRTY CASES WITH VISION = 20/40 OR BETTER TAKEN FROM THE RECORDS OF DR. F. CLARK

ASTIG. BEFORE OP.	TWO WEEKS AFTER	TWO TO SIX WKS.	SIX TO 12 WKS.	3 TO 6 MONTHS	6 TO 12 MONTHS	1 TO 3 YEARS	LATER	REMARKS
1. Mr. T. J. A.	9 days 2D ax. 30° 3/4					2 Yrs. 7 Mo. 5 ax. 15° 3/4	4 1/2 Yrs. 4 ax. 5° 3/4	2 Yrs. 7 Mo. Javal, 3.5 ax. 15°. (See L. E. 14)
2. Mrs. W. A. W.	10 days 2D ax. 90° 3/4							See L. E.
3. Mrs. M. A. Y.	1D ax. 90°			4 Mo. 1.5 ax. 15° 3/4				Javal 5. ax. 75°
4. Mr. J. E.	2 wks. 3 ax. 165° 3/4			4 Mo. 2 ax. 180° 3/4				
5. Mrs. S. D.				3 Mo. 2 ax. 180° 3/4				
6. Mr. G. W.	1D ax. 45°			6 Mo. 2.5 ax. 160° 3/4				
7. Mr. L. H. H.		17 days 3.5 ax. 10° 3/4						
8. Mr. W. L.					8 Mo. 0° 3/4			8 Mo. Javal 1 ax. 150°
9. Mrs. J. S.	10 days 6 ax. 150° 3/4		7 wks. 1 ax. 180° 3/4					10 Days Javal 8.5 ax. 150°. Later 1 ax. 150°
10. Mr. J. S.						2 1/2 Yrs. 5 ax. 180° 3/4		15 Days Javal 6.5 ax. 100°
11. Mrs. W. F. E.	15 days 6 ax. 150° 3/4					2 1/2 Yrs. 1 ax. 15° 3/4		14 Days Javal 3.5 ax. 5-10°. 2 1/2 Yrs. 1 ax. 15°
12. Mr. W. T.	19 days 3 ax. 15° 3/4							10 Days Javal 7.5 ax. 10°
13. Mrs. M. R.	10 days 7 ax. 10° 3/4					1 1/2 Yrs. 2 ax. 150° 3/4		11 Mo. Javal 2 ax. 20°
14. Mrs. J. W. R.	11 days 4.5 ax. 190° 3/4		3 wks. 3 ax. 180° 3/4		11 Mo. 2 ax. 180° 3/4			12 Days Javal 7.5 ax. 150° 1/2 Yrs. Javal 2 ax. 150°
15. Mrs. W. A. W.	2 mps. 7 ax. 150°					1 1/4 Yrs. 5 ax. 15° 3/4		5 1/2 Wks. Javal 9 ax. 15°. 1 1/4 Yrs. Javal 6.5 ax. 15°
16. Mrs. M. K.		5 1/2 wks. 6 ax. 15° 3/4		5 Mo. 0° 3/4				2 Mos. Javal 2 ax. 15°
17. Mrs. H. A. M.			8 wks. 1 ax. 15° 3/4					2 Wks. Javal 13 ax. 170°
18. Mrs. G. W. H.			9 1/2 wks. 2.5 ax. 165° 3/4					20 Days Javal 2 1/2 ax. 65°
19. Mr. D. B.	19 days 6 ax. 165° 3/4			1 1/2 Mo. 0° 3/4				8 1/2 Wks. Javal 11 ax. 165°
20. Mr. S. C.		6 1/2 wks. 1 ax. 30° 3/4						10 Mos. Javal 5.5 ax. 165° Capsule shrunken.
21. Mrs. M. H.	5 ax. 30°		2 1/2 wks. 7 ax. 165° 3/4					Relapse of Iris
22. Mrs. E. K.	125° ax. 30°							32 Days + 9 1/4 Yrs. = 3 3/4
23. Mrs. J. H. H.		19 days 3 ax. 165° 3/4		4 1/2 Mo. 5 ax. 180° 3/4				4 Mos. 3.5 ax. 170° 5 wks. 4 ax. 165° 3/4
24. Mrs. J. L.		3 wks. 6 ax. 190° 3/4						8 Mos. Javal 2 1/2 ax. 15°
25. Mrs. A. W.		30 days 0°						10 Wks. Javal 5 ax. 45°
26. Mrs. O. F. W.		20 days 3 ax. 180° 3/4	11 wks. 2.5° 3/4					18 Days 2.5 ax. 170°
27. Mrs. M. K.		14 days 1.5 ax. 180° 3/4	8 wks. 2 ax. 155° 3/4					
28. Mr. W. T.		10 days 4 ax. 170° 3/4	6 wks. 1 ax. 190° 3/4					
29. Mr. W. H.			7 wks. 1.5 ax. 58° 3/4					
30. Mr. P. J.	35 D ax. 80°							
	7 Cases 30-5 Days 4.5°	13 Cases 49-12 ax. 37°	9 Cases 32 ax. 55°	7 Cases 150 ax. 185°	2 Cases 2D ax. 1°	5 Cases 16-5D ax. 33°	1 Case 4D	

may be avoided by the performance of an iridectomy, I have made a comparison between my own results in thirty consecutive cases and the same number reported by Dr. J. A. Lippincott.¹ And as the proportionate degree of influence which astigmatism exerts in reducing the vision of an operated eye is difficult to estimate when associated with defects in the retina, opacities of the capsule, or other lesions of transparency, I have, for the purpose of this comparison, excluded all those cases in which the vision fell below 20/40. Dr. Lippincott makes a small, preliminary iridectomy, generally downward, and freely irrigates the aqueous chamber with an excellent instrument which he has devised for that purpose.

In my own cases a simple extraction was performed and the aqueous chamber freely irrigated, generally with an Andrews' dropper or pipette. In a few instances I adopted a plan which suggested itself to me some months ago and which I have since found to serve an excellent purpose. After freely dividing the anterior capsule in such a manner as to detach, where it is practicable, a quadrangular portion from the pupillary area, and stirring up the anterior cortex, if that prove to be soft, I irrigate thoroughly while the nucleus remains in position to protect the posterior capsule, and before the suspensory ligament has been stretched by the effort to

- 3.—D. R., astigmatism three months after operation, 0 = 20/40.
- 4.—J. R. S., astigmatism three and one-half weeks after operation 1.5 ax. 180 = 20/20.
- 5.—Mrs. S. S., astigmatism seven weeks after operation, 1. ax. 20 = 20/20.
- 6.—J. K., astigmatism eight and one-half months after operation, 0 = 20/20. Vision in this case slightly reduced later.
- 7.—Mrs. J. M., astigmatism four weeks after operation, 0 = 20/30.
- 8.—J. W. H., astigmatism seven weeks after operation, 0 = 20/20; nine and three-fourth months after operation 0 = 20/15.
- 9.—J. S., astigmatism five weeks after operation, 0 = 20/30; nine and one-half months after operation, 0 = 20/60.
- 10.—Mrs. W. H., astigmatism five weeks after operation, 1. ax. 180 = 20/30. Later (ten months after operation) reduced to 20/30.
- 11.—W. H., astigmatism five weeks after operation, 0 = 20/30.
- 12.—Miss E. D., astigmatism ten months after operation, 0 = 20/40.
- 13.—Mrs. W. C., astigmatism nine and one-half weeks after operation, 3 ax. 20/20.
- 14.—Mrs. J. B., astigmatism three and three-fourth months after operation, 2. ax. 180 = 20/40.
- 15.—Mrs. J. L., astigmatism eight weeks after operation, 2. ax. 180 = 20/30.
- 16.—J. McA., astigmatism six and one-half weeks after operation, 2. ax. 180 = 20/70; five months after operation, 3.5 ax. 25 = 20/30. Loss of Vit. Slow healing.
- 17.—Mrs. J. M. S., astigmatism eight weeks after operation, 0 = 20/40.
- 18.—Mrs. L. K. F., astigmatism ten weeks after operation, 0 = 20/20.
- 19.—Mrs. J. C., astigmatism seven months after operation 3. ax. 180 = 20/30.
- 20.—G. M., astigmatism six weeks after operation, 2 ax. 180 = 20/30; three and one-half months after operation 1. ax. 180 = 20/40.
- 21.—P. D., astigmatism five months after operation, 0 = 20/30.
- 22.—G. C., astigmatism three months after operation, 0 = 20/30.
- 23.—J. G., seven and one-half weeks 1. ax. 180 = 20/30.
- 24.—G. E., astigmatism five and one-half weeks after operation, 1. ax. 30 = 20/20.
- 25.—Mrs. M. R., astigmatism ten weeks after operation, 0 = 20/40.
- 26.—C. S., astigmatism nine weeks after operation, 0 = 20/30.

¹ Trans. Am. Oph. Society, 1891.

² Knapp's Archives, vol. xxv, p. 333.

27.—Mrs. T. J., astigmatism thirteen days after operation, 2.5 ax. 180 = 20/30; ten and one-half weeks after operation, 2. ax. 180 = 20/30.

28.—S. P., astigmatism four weeks after operation, 1. ax. 180 = 20/30.

29.—P. V. J., astigmatism nine weeks after operation, 2. ax. 180 = 20/30.

30.—Mrs. W. C., astigmatism nine and one-half weeks after operation, 0 = 20/40.

In two cases astigmatism two weeks after operation, = 3.5 D., average, 17.5; in ten cases, two to six weeks after operation, = 14.5 D., average, 1.45; in fourteen cases, six to twelve weeks after operation, = 16. D., average, 1.14; in six cases, three to six months after operation, = 7.5 D., average, 1.25; in five cases, six to twelve months after operation, = 3 D., average, 0.6.

As a summary of the above tables we have the following: Thirty consecutive cases of simple extraction compared with thirty cases of extraction after preliminary iridectomy, excluding all those in which vision fell below 20/40.

	C. F. C.	J. A. L.
Simple Extraction. After prelim. Irid.		
Average degree of astigmatism at last examination	2.7 D.	0.96
No astigmatism	3 Cases.	14 Cases.
2 dioptries or more	20 "	8 "
4 "	7 "	0 "
5 "	5 "	0 "
Highest degree of astig.	7 D.	3.5 D.
Average vision	20/25.36	20/31.33
20/20	18 Cases.	6 Cases.
20/25	1 "	0 "
20/30	4 "	14 "
20/36	4 "	0 "
20/40	3 "	10 "

A careful study of the complete list from which the above cases were drawn reveals a very slight advantage in average results in favor of the operation with a preliminary iridectomy, but when the individual cases are studied there remains a doubt in one's mind as to its real advantage in this respect.

That a preliminary iridectomy greatly diminishes the tendency to the production of post-operative astigmatism is reasonably established by the above figures. Whether it accomplishes this: 1, by permitting the more thorough cleansing of the aqueous chamber; 2, by allowing the aqueous to escape through the coloboma and between the lips of the wound, thus relieving temporary increase of intraocular tension during the healing process, as has been claimed for it by its advocates; or 3, whether the larger pupillary opening and the cicatrization of the edges of the coloboma prevent, in a measure, the contusion and inflammatory reaction in the iris which at times retards the healing process and thus favors the displacement of the edges of the wound, may be an open question. But I am strongly of the opinion that the more thorough cleansing and the avoidance of contusion of the iris during the delivery of the lens are the most important factors in preventing the development of astigmatism.

In order to make a fair comparison of the degree of astigmatism following the various methods of operating it is necessary to confine ourselves to a study of corresponding periods after the operation, or to choose a period so late as to be reasonably sure that no change is likely to occur. This limits us to a small number of cases for comparison, but the following tables, while for this reason they are not conclusive, are of interest as they include a comparison of the results as far as astigmatism is concerned, of three instead of two operators.

While the average degree of astigmatism in my cases was lower than that reported by Pfingst at the end of two weeks after the operation, it will be observed that at the end of six or eight weeks it was somewhat in excess, while at every period at which comparison was

made, Dr. Lippincott, who performs a preliminary iridectomy, had a much lower average.

We are, perhaps, not justified in drawing conclusions on so important a subject from so small a number of cases, nor from the work of so limited a number of operators, but judging by the facts at our command, it would seem that a cataract extraction after a preliminary iridectomy is apt to be followed by far less astigmatism than a simple extraction, and one would naturally draw the inference from this that an operation with preliminary iridectomy as practiced by Dr. Lippincott was to be preferred, but it would appear that, at least in the series of cases presented above, this advantage is gained at the expense of a sacrifice in acuity of vision, as there were only six cases with vision of 20/20 among the thirty in which a preliminary iridectomy was performed as compared with eighteen among an equal number with simple extraction.

A COMPARISON OF THE DEGREE OF ASTIGMATISM FOUND AFTER OPERATION IN A SERIES OF EIGHT CASES IN WHICH ASTIGMATISM WAS MEASURED SIX TO EIGHT WEEKS AFTER OPERATION. RECORDED BY A. O. PFINGST, J. A. LIPPINCOTT AND C. F. CLARK.

		A. O. P.	J. A. L.	C. F. C.
2 wks after Op.		46 Cases, Aver. 6.3 D *	2 Cases Aver. 1.75 D	9 Cases Aver. 4.72 D
1.	6 weeks after op. 2. D	8 weeks after op. 4.5 D	7 weeks after op. 2.5 D	
2.	8 weeks after op. 1.25 D	6 weeks after op. 1. D	8 weeks after op. 2. D	
3.	8 weeks after op. 2.5 D	6 weeks after op. 2. D	8 weeks after op. 1. D	
4.	6 weeks after op. 7. D	8 weeks after op. 0. D	7 weeks after op. 1. D	
5.	6 weeks after op. 2.25 D	6 weeks after op. 2. D	7 weeks after op. 4. D	
6.	8 weeks after op. 1.25 D	8 weeks after op. 2. D	8 weeks after op. 3. D	
7.	6 weeks after op. 2. D	6 weeks after op. 0. D	6 weeks after op. 6. D	
8.	6 weeks after op. 2.5 D	7 weeks after op. 1. D	7 weeks after op. 3. D	
		8 20.75 D	8 12.5 D	8 22.5 D
Average astig.		2.59 D	Average Astig. 1.56 D	Average Astig. 2.81 D
Highest		7. D	Highest 4.5 D	Highest 6. D
Lowest		1.25 D	Lowest 0. D	Lowest 1. D

* These records were taken from cases in the practice of H. Knapp of New York.

[Discussion next week with other papers of the symposium.]

PANCREATIC HEMORRHAGE.

WITH REPORT OF TWO CASES; AND A TABULATED LIST OF CASES FOUND IN LITERATURE—FORTY IN NUMBER.*

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PHILADELPHIA.

I desire at the outset to give an abstract of the histories of two cases.

CASE 1.—S. C. N., aged 28 years, single, a physician, was admitted to the Medico-Chirurgical Hospital, July 26, 1898. The family history revealed the fact that his father had died of pernicious anemia two years previously. All of the remaining members of his immediate family were living and healthy.

The patient had had some of the affections peculiar to childhood, and whooping-cough only two years prior to the onset of his last illness. The disease that caused his death began two months before the date of admission, with an acute onset. The patient first experienced a severe pain in the epigastric region, followed by slight diarrhea. In a few days the latter ceased, and was succeeded by obstinate constipation—a symptom that was present throughout the rest of the illness. Ten days after the date of onset jaundice set in, and gradually deepened until it became quite pronounced;

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