The resulting stump was just as good as that obtained by any other method. Some of these procedures are probably well known to readers of this article but the fact that they have stood the test of long experience is a guarantee of their efficacy for those who have not tried them.

Similar articles by other ophthalmic surgeons describing procedures which have stood the test of time would be of immense value to the younger school and well worthy of publication.

ABSTRACTS

MISCELLANEOUS


(1) After a critical examination of existing theories Ridley concludes that the evidence does not justify the belief that the aqueous drains into the scleral veins via Schlemm’s canal or into the capillaries of the iris. The experiments upon which Leber based his conclusion that the cornea is impermeable are also challenged.

A series of experiments upon excised eyes and upon the living eye in the anaesthetized rabbit is advanced to show that the normal cornea is permeable in both directions to water and diffusible substances in solution and that this permeability is most marked at the periphery. Impregnation of the cornea with dyes or silver salts shows that the cornea extends to the root of the iris and that the pectinate ligament is opposed to corneal tissue.

Previous work upon the aqueous is briefly reviewed and the view that it is formed by dialysation is supported. Recent work by Adair upon the “activities” of ions in physiological fluids is advanced in opposition to Duke-Elder’s view that a Donnan equilibrium has been demonstrated between the blood and aqueous; the latter’s conclusion that there is normally no drainage of the aqueous is disputed.

Tears are next examined in the same light. An analysis of tears shows that the diffusible constituents of blood are present in similar proportion and the osmotic pressure of tears was found to be a little less than that of the blood. The salt content of tears is only 0.658 per cent. while the protein is as high as 0.669 per cent. The sugar content is given erroneously as 0.65 per cent; this should read 0.065 per cent. Under carefully reconstructed physio-
logical conditions in the recently excised eye the flow of fluid through the cornea was found to be 0.87 c.mm. per minute at 25 mm. Hg and 1.13 c.mm. per minute at 50 mm. Hg pressure. These figures are in agreement with Friedenwald's figures for the formation of aqueous in the living eye.

Ridley concludes that the cornea is permeable to all the constituents of the fluids bathing it except protein, that these fluids are of similar composition and osmotic pressure, that the intra-ocular pressure constantly forces fluid through the cornea and that this is assisted by the osmotic pressure and properties as regards surface tension contributed by the tears' protein.

Since the contents of the globe are incompressible change of intra-ocular pressure can arise only by change of volume of globe contents apart from extraneous pressure upon the globe, and the intra-ocular pressure at any moment is determined by the tension created in the scleral wall by its distension to the volume of globe contents. Ridley concludes that change of blood volume in the eye, alone, determines change of intra-ocular pressure within a short space of time. The change of pressure to which a given volume change would give rise can be determined by reference to curves of distensibility reproduced. From these curves the volume of blood normally present in the eye can be deduced and this was confirmed in the living rabbit by direct measurement. The expansion of which the vascular bed is capable was also determined and it is shown that sudden complete loss of active tone in a normal eye—unaccompanied by a fall in blood pressure—would produce a rise of intra-ocular pressure limited only by the highest vascular pressure existing in the eye. In glaucoma the distensibility curve is very steep and changes of vascular tone may produce abnormally great pressure changes in such eyes; Ridley suggests that tonometric measurements in glaucoma may be excessive for this reason.

The paper proceeds to an examination of the relation between vascular tone, pressure and volume in the eye and this is correlated with the intra-ocular pressure, scleral distensibility and osmotic pressures of the aqueous and blood in a series of six equations. Ridley suggests that if the rate of drainage through the cornea (in which he includes the filtration angle) falls, a point will be reached at which the accumulation of katabolic products in the aqueous, assisted by the fact that diffusion into the ciliary processes is now antagonized by the outward flow of aqueous, will give rise to loss of active tone in the ciliary vessels. Failure of drainage is thus brought into line with the preceding argument. The factors influencing the rate of drainage through the cornea, namely intra-ocular pressure, corneal permeability and osmotic pressures of aqueous and tears are correlated in three equations.
and it is shown that a rise of intra-ocular pressure is the only mechanism by which failure of adequate drainage can be compensated.

Much clinical and experimental experience appears to be satisfactorily explained by this work. The paper is, however, too technical to be conveyed adequately in abstract form.

ARNOLD SORSBY.


(2) Trubin examined the buphthalmic eyes of an infant aged 11 months, and found (besides congenital abnormalities in the posterior part of the eyes) signs of arrested development in the anterior portion—corresponding to the fifth month of foetal life— together with an adhesion between the lens and the cornea. These latter findings he regards as of primary importance for the study of the pathogenesis of hydrophthalmos congenitus, congenital opacities of the cornea, and anterior lenticonus.

His conclusions are as follow:

(1) Congenital hydrophthalmos is due to a developmental anomaly in the anterior portion of the eye.

The initial abnormality is the delayed formation of the anterior chamber, due to the adhesion of the lens capsule to the cornea. The consequences of this delayed formation are seen in the absence or imperfect development of Schlemm's canal, and the signs of arrested development in the iris—aniridia, coloboma, and imperfect formation of the mesodermal layer with absence of the crypts.

The closure, or developmental defect, of Schlemm's canal causes an arrest of filtration from the anterior chamber, and thereby a condition of glaucoma. The plasticity of the fibrous coat in the infant eye leads to buphthalmos.

The partial or more frequently complete separation of the lens from the adherent cornea produces the well-known tears in Descemet's membrane, the origin of which is attributed by most authors to excessive growth of the cornea.

(2) Congenital opacities of the cornea, which often occur in cases of buphthalmos, or are seen in the eyes of new-born infants that were later affected with buphthalmos, are caused by an incomplete development of the corneal tissue and embryonic vascularisation, due to its adhesion to the lens.

Another anatomical basis for these congenital corneal opacities is found in the defect in Descemet's membrane, which owes its
origin to the stretching of the synechiae (between iris and cornea) that arise from the iris and are the remnants of the so-called lamina irido-pupillaris.

(3) Signs of an adhesion between the lens and the cornea are seen (in the lens), according to the firmness of the adhesion, in the form of lentiglobus, lenticonus, or pyramidal cataract, which may lose or retain their connection with the cornea, or lastly, sub-capsular cataract at the anterior pole.

THOS. SNOWBALL.


(3) Abe and Komura found that when fluorescein, which they employed to study the outflow of the aqueous, is introduced into the circulation intravenously, its concentration in the aqueous reaches its highest point 30 to 40 minutes after its injection; it then diminishes, at first slowly, afterwards more rapidly, and still later at a slower rate. The initial rise is due to the diffusion of the fluorescein into the aqueous, and the subsequent fall to its passage outwards through the anterior chamber angle.

The diffusion of the fluorescein into the aqueous does not appear to be very definitely assisted by the closure of the lids, but its outflow from the anterior chamber is markedly accelerated by their action.

In rabbits narcotized with urethane, whereby the pressure of the extra-ocular muscles on the eye was avoided, it was established that the rate of the outflow of the fluorescein from the anterior chamber was enormously retarded.

The rate of outflow of the aqueous in the normal rabbit, according to their experiments, is 4'87 c.mm. per minute, and the time required to fill the anterior chamber once is 62 minutes (when the total content of the anterior chamber in medium-sized rabbits is on the average 0'3 c.cm.)

Theoretically the amount of aqueous passing out per minute in the human eye is reckoned as 3'8 c.mm., and the time required for filling the anterior chamber once is 63 minutes, the total amount of aqueous in human eyes being on the average 0'24 c.cm.

The rate of outflow of the aqueous in the eyes of rabbits, when the action of the lids is increased in frequency, is greatly accelerated, and in eyes with 10 movements of the lids per minute amounts to 8'02 c.mm., so that the difference in the amount of the
aqueous passing out in the eyes of normal rabbits as compared with those with increased action of the lids (3:15 c.mm.) must have been produced by the movements of the lids. One movement of the lids, therefore, increases the outflow by 0:315 c.mm. aqueous.

These facts justify the conclusion that the lid closure must play an important rôle in the mechanism of the exchange of the aqueous.

**Thos. Snowball.**


(4) Mächler analysed a series of 67 cases in which there was a difference of at least 3D. in the total refraction between the eyes, giving various tables of these cases according to the presence and degree of direct and inverse astigmatism.

His measurements indicate that in the majority of the cases the curvature of the cornea remains practically the same in both eyes.

A remarkable feature was the asymmetrical position of the principal axes in a comparatively large proportion of the cases.

No rule, however, can be laid down as to the incidence of direct and inverse astigmatism in the individual type of refraction; his figures certainly give no indication that inverse astigmatism, or a tendency to it, specially affects the eye with axial myopia, but they show that the inherited factor (gene), which determines the refraction of the cornea in anisometropes, is to a very large extent independent of the axial refraction of both eyes: one eye may show a very high degree of axial myopia, the other may be emmetropic or hypermetropic, and the corneal refraction may be the same in both.

**Thos. Snowball.**


(5) Car and Ortynski in this article first review the literature bearing on the various factors that affect the regeneration of the anterior chamber, and then give an account of experiments on rabbits, in which they studied the results of subconjunctival injections of various hormones on the aqueous, as an extension of the work already done on adrenalin, directing their attention to a determination of the refractive index in the first and regenerated aqueous, and an estimation of the protein content.

In place of adrenalin they employed glaucosan, and found that
the refractive index and the percentage of protein in the second aqueous were diminished as compared with the normal eye, while the regeneration of the anterior chamber was delayed and the tension of the eye reduced.

Glanduitrin (pitruitin), it was found, gave a more intense reaction than glaucosan. Parathyroid extract was similar in its action to glanduitrin and adrenalin. Insulin yielded similar, though less marked, results.

In these cases there was no appreciable action on the blood-vessels, so that the diminution in the protein was attributable not only to the vasoconstrictor, but also perhaps to the osmotic and secretory factors in its excretion.

The amount of protein in normal conditions varies between 2.5 and 3.2 per cent. Similar results were obtained with extracts of the thyroid, thymus, testicle and ovary.

THOS. SNOWBALL.


(6) Beeler collected and clinically examined 35 cases (62 eyes) of heterotypical conus, and in this paper records his observations. This condition was bilateral in 27 cases, and apart from a few exceptions in young persons was always associated, even with correcting glasses, with subnormal vision.

The position of the conus was inferior in the great majority of the cases; in a few it was situated below and to the nasal or temporal side. In only two eyes was it on the nasal side.

Its breadth apparently increased with the age of the patient and, as regards the refraction, with a change from hypermetropia to myopia. It was found more frequently in females than in males (26 : 9).

Distinct ectasia of the fundus in the immediate neighbourhood of the conus was noted in a large proportion of the cases, and this ectasia was associated with a relative loss of pigmentation over this area.

Inferior conus, like that in axial myopia, may be followed by an atrophy of the choroid, which progresses with age and with increase in the refraction. The ectasia of the fundus downwards is in this sense comparable with that seen in myopia.

Heterotypical conus, in whatever position it occurs, is as frequently inherited as H. and M. and other refractions, and like the latter may be regarded as a developmental anomaly.

THOS. SNOWBALL.

(7) Hecht's article is an attempt to give a theoretical explanation of the relationships observed between visual acuity and illumination. He starts with the reasonable assumption that the resolving power of the retina varies with the average distance between the sensitive elements. It follows, therefore, that as the visual acuity, i.e., the resolving power of the eye, is diminished by low illumination, there must be fewer sensory elements working per unit area, and conversely, that as the illumination increases, more and more retinal elements reach this threshold of illumination so that visual acuity increases, up to a point when all the elements are functional and no further increase is possible. Another way of stating this is to say that the percipient elements of the retina must have different thresholds, so that in low illumination only a few, the most sensitive, will respond to the stimulus, whereas in higher illumination, the less sensitive are also brought into action. Before making this hypothesis strictly quantitative, it is necessary to consider the effect of the size of the pupil on the illumination of the retina. Reeves has provided data for this, in the form of a curve giving the relationship between the pupil area and illumination. Assuming now that the distribution of thresholds of rods and cones follows the usual biometric laws, we can work out the number of rods and cones which are functioning per unit area at any intensity. When this is done, and the curve is corrected for the effect of the pupil, the result is the same as the curve obtained experimentally by observing the relationship between illumination and visual acuity. It is possible, theoretically, to work out one curve for the rods and one for the cones, the complete one representing, of course, the sum of these two. It is interesting to note that in completely colour blind individuals the luminosity acuity follows the curve worked out for rods alone, while in the normal eye, the cones overtake the rods at the middle of the latter's range of acuity. The author then goes on to consider whether there is such a thing as a unit retinal area, and if so, how many elements it contains. Working with the brightness discrimination test, Koenig found that the whole range consisted of 572 distinct steps, about 30 being mediated by the rods and the remainder by the cones. The recognition of the "step" presumably means the stimulation of an additional element. We are, therefore, justified in assuming the existence of 542 cones in our minimal unit retinal area. The problem can be attacked in another way. The lowest visual acuity obtained by diminishing illumination corresponds to a visual angle of slightly over 44 minutes, which represents a distance of 0·2 mm. on the retina. The minimal area would thus be 0·04 sqr. mm., an area
which histologically has been found to contain 540 cones. Finally, if Young's theory of colour vision be true, the same result is obtained by the following inductive process. There are three kinds of cones, sensitive respectively to red, green and blue. Now, if there are 540 cones per unit area and the number of each kind is equal, there must be 180 of each. If discrimination of a spectral hue involves on the average a change in one of each species of cone, then the number of monochromatic patches obtainable with a spectrum should be 180, a figure which agrees remarkably well with what has been found by experiments performed by various observers.

F. A. W-N.


(8) This research by Blank on the bacteria found on the surface of the normal cornea and their relation to those on the surrounding normal conjunctiva was carried out on patients over 40 years of age, because this question is of special importance in elderly people who require operation for cataract or glaucoma, and because the bacteria found in the normal conjunctiva and cornea are more numerous in elderly persons than in young individuals.

It was found that the conditions in the two eyes of the same patient were frequently different.

In a large proportion of the eyes the bacteria on the cornea and on the conjunctiva were the same, viz., pneumococci either alone or with staphylococci and/or xerosis bacilli.

In only a few cases were pneumococci found on the cornea alone, but absent in the conjunctival sac.

With few exceptions the bacteria derived from the surface of the cornea grow more sparingly than those obtained from the conjunctiva.

These tests confirm the view that besides staphylococci and xerosis bacilli, chain-forming cocci (which for the most part are probably pneumococci) live as saprophytes in the conjunctival sac and frequently, perhaps in all cases, on the cornea of normal eyes, especially in elderly people, but that it is probably in many patients impossible to demonstrate their presence.

THOS. SNOWBALL.


(9) The term asteroid hyalitis is applied to the formation of snowball opacities in the vitreous, an appearance first described by Benson in 1894. Examination of these bodies has already been
made by Verhoeff and by Bachstez whose findings agree in the main with those reported in this paper. Holloway and Fry’s case was a man aged 69 years, who had a trephining done for acute glaucoma and died 12 days later from coronary thrombosis and broncho-pneumonia. The eye was enucleated one hour after death. It is interesting to note that a ciliary process was pulled forward and was adherent to the trephine opening, and that the anterior part of the choroid was detached from the sclera by a uniform homogeneous exudate. The rod and cone layer of the retina had degenerated but other layers were present. The snowball-like opacities which had been observed ante mortem in the vitreous, were most numerous in the lower part of the anterior two-thirds of the globe. The majority of them formed a column-like arrangement, beginning just anterior and slightly internal to the ora serrata, curving in a slight arc inwards and backwards for a distance of 6—8 mm., where the arrangement, became less regular. By transmitted light they appeared nearly black and by reflected light they appeared as snow-white spheres, varying from 0.08 to less than 0.01 mm. in diameter. They were firm enough to resist crushing between slides and gave reactions indicating the presence of a carbonate, calcium, a sterate or a palmitate or both and probably lipoids in combination.

F. A. W -N.

(10) Brinton, A. G. (Johannesburg).—The frequent association of diseases of the eye with pathological conditions of the tonsils and sinuses. The Jl. of the Med. Assoc. of South Africa (B.M.A.), October 26, 1929.

In addition to asthenopia almost every structure of the globe is mentioned as being liable to either direct or indirect infection arising from these sources.

One case is given in some detail and is of interest.

A young girl whose vision, both central and peripheral, failed suddenly and almost totally, was found to have optic neuritis in each eye.

No cause was found other than septic tonsils, which were enucleated ten days after the onset of the trouble, and within a week after being first seen.

In three days a striking improvement in vision followed, and after two months, during which time an autogenous vaccine was
used, the vision was normal in each eye with a full field and the fundi presented a normal appearance.

The paper is of value inasmuch as the importance of neighbouring foci of infection should never be forgotten in almost any ocular inflammation, but it would have been of even more value if the author had generalized less and given fuller details of more cases in support.

A further paper by him on the effects of tonsillar enucleation in cases of spring catarrh would be welcomed.

BERNARD CRIDLAND.

(11) Rossi, Domenico (Florence).—Clinical and histological researches on the experimental infection and re-infection of the eye with tubercle. *Boll. d'Ocul.*, October, 1929.

(11) After giving a short résumé of the literature of experimental infection of rabbits' eyes, Rossi describes his own technique and results, illustrated by microphotographs.

In the first series of experiments he inoculated the eyes of healthy rabbits, while in the second series (that which he refers to as re-infection) the eyes inoculated were those of rabbits into which tubercle bacilli had been introduced under the abdominal skin two months before. The object of his experiment is to show that the clinical course of the tuberculous eye lesions differs in the two cases, as well as their histological details: he found epithelioid cells only, in tuberculous foci of the first series, whereas in those of the second, both epithelioid and giant cells were present.

LESLIE PATON.


(12) Pearson and Usher have continued through many years a research on the experimental breeding of dogs, begun by them in conjunction with the late Edward Nettleship in 1905. Their labours are still unfinished but they are now able "to report on one aspect of the investigation, viz: Albinism in Dogs." The original stock consisted of Albino Pekinese and pure-bred black Pomeranians, and in successive generations three types of Albino dogs were obtained, called respectively the Dondo or White Albino (the commonest form), the Cornaz Spaniel, and the Skewbald.

There are 19 pages of letterpress, eight full-page plates, of which two are in colours, and two long pedigrees in this paper. It teems with facts and observations arranged with the meticulous care which characterizes the published work of the two authors. The results they have achieved and their presentation
of them would have been most gratifying to their early collaborator Nettleship. For the years of continuous work and observation, of which this paper is but a limited record, the authors deserve much praise. The tale is one which cannot be told intelligibly in an abstract, and we can but counsel a study of the original. The printing and plates are extremely well done, as is usual in this journal.

J. B. Lawford.

(13) Kiso, Keigo (Tokio).—Contributions concerning the inheritance of opaque nerve fibres of the retina. (Beiträge zur Kenntniss von der Vererbung der markhaltigen Sehnervenfasern der Netzhaut). Arch. f. Ophthal., Bd. CXX, April, 1928.

(13) This is an exhaustive paper on the subject. There are a dozen fundus pictures reproduced in black and white.

Kiso summarizes as follows:—
1. Six cases of opaque nerve fibres have been ascertained in one family. This provides an important basis to our understanding of the inheritance of the anomaly.
2. . . . . in most cases of uncommonly extensive opaque nerve fibres, other kinds of congenital anomalies also occur.
3. In the four cases without other congenital anomalies discovered in Japan, congenital luetics were concerned. Therefore, an acquired condition could be a cause for the occurrence of extensive opaque nerve fibres.
4. As regards the complications, a great difference between the extensive and minor forms of this anomaly is noticeable and the frequent occurrence of complications in the minor forms is not accidental.
5. Both forms are caused by one and the same inheritance factor.
6. One may assume that the inheritance factor lies in the X-chromosome. The decision on the point is best left to further investigation.

D. V. Giri.


(14) This contribution is based on the determination of the blind spot in healthy emmetropic eyes of 33 individuals of 20 to 24 years of age, at a distance of 1 m. from the Bjerrum screen with a test object 0.5 cm. in diameter. In each case the boundary of the blind spot was defined in two ways:

(1) by moving the test object from the seeing into the blind area and out of the latter again into the seeing;
(2) by moving the object from the blind area into the seeing. The area mapped out by the first method was smaller than that defined by the second.

Of the 33 cases, in 13 the blind spot was an absolute scotoma and in the remaining 20 there were faintly perceptive parts.

Incze concludes that the correct boundary of the blind spot is the one obtained by moving the test object from the blind into the seeing area and that the smaller blind spot mapped out by the reverse process is an artefact.

In practice he recommends the charting of the blind spot by both methods as the extent of the relatively blind area between the two boundaries is often of diagnostic value.

D. V. Giri.


(15) The functional connection between the movements of the upper eyelid and those of the lower jaw was noted by Marcus Gunn in 1888. Almost half a century has passed and the aetiology of the phenomenon is still obscure. In 1925, Villard found 93 cases on record; since that date a few have been published chiefly by French observers. Charamis gives briefly the varied hypothetical explanations of the phenomenon, but repetition of them is scarcely necessary; actually the pathogenesis of the condition is unexplained, but as Villard remarks, this ignorance is not very surprising when we remember that in the whole series of reported cases, there is not one in which the clinical observation has been supplemented by a necropsy.

The condition, as originally described, is characterized by congenital unilateral ptosis, usually incomplete, and uninfluenced by voluntary effort. Opening of the mouth is accompanied by elevation of the drooped eyelid, increasing as the mouth is more widely opened.

The abnormal forms (that is forms more or less at variance with Gunn's description) have been divided into three groups according to their relation to the muscles innervated by the facial, the glossopharyngeal or the oculo-motor nerve. Generally, this grouping seems adequate; we find in the literature cases in which the phenomenon is induced by the action of muscles innervated by the fifth, seventh and twelfth nerves.

Since Villard's paper some observations have been published of cases still more paradoxical and complex. Benoit (1926), describes a case of an inverse syndrome, i.e., one in which movement of the lower jaw induced ptosis. This patient was the subject of facial paralysis and Benoit suggests as an explanation
the existence of peripheral anastomosing filaments innervating the fibres of the paralysed nerve.

Fromaget and Brun (1926), report a complex case in a young man with complete right-sided ptosis. Contraction of the elevators of the lower jaw, and lateral movements of it, were accompanied by raising of the drooped eyelid; contraction of the orbicularis palpebrae, closing the lid on the left (sound) side also caused the right upper lid to be raised.

Dupuy-Dutemps (1929, records a case of Gunn’s phenomenon in which with the mouth open (and consequently the affected eyelid raised), movement of the jaw to the side of the ptosis induced lowering of the lid. With the mouth closed protrusion of the chin and lateral movements of the jaw provoked the usual phenomenon.

A similar case has been observed by Leri and Weil (1929). Charamis’s case, illustrated by six photos, showed a functional connection between the levator palpebrae and almost all the muscles concerned in mastication and in the movement of the skin of the face. The man had almost complete right ptosis, and paresis of the superior rectus on the same side. On opening the mouth to its full extent, the lid was raised so that the whole of the cornea was exposed, but if the jaw was passively lowered no elevation of the lid occurred. With the mouth closed, protrusion of the chin induced elevation of the drooped lid; the same movement was observed if, with the mouth still closed, the teeth were forcibly pressed together. Lateral movements of the jaw to either side corrected the ptosis. With the mouth gently closed, opening the lips, to show the teeth, induced elevation of the eyelid though to a less extent than with jaw movements. Deglutition of solids and fluids, the mouth being closed, caused the lid to be widely opened.

Charamis’s patient was one of two survivors of a sibship of five. There was a history of ptosis in the father (dead) and the living brother was the subject of ptosis, of less degree than the patient.

Villard in his paper states that only four instances of heredity of the Marcus Gunn phenomenon were on record: since that date one by Leri and Weil and the author’s case have come under observation.

Terrien, in whose clinic this case occurred, has expressed the opinion that in all patients with congenital ptosis the Marcus Gunn phenomenon is present in slight degree but is usually unnoticed.

J. B. Lawford.