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COMMUNICATIONS

SOME OBSERVATIONS ON THE CAUSES AND TREATMENT OF SIMPLE DETACHMENT OF THE RETINA

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THIS paper presents some observations made on the history, physical signs, treatment, and subsequent progress of 100 patients suffering from simple detachment of the retina. Fifteen of these patients attended St. Bartholomew's Hospital between 1923 and 1927, and information concerning the remainder has been obtained from reliable case notes taken by English, American, and various continental ophthalmic surgeons.

Simple detachment of the retina is a line of cleavage formed between the layer of pigment epithelium and the percipient neural portion, over a part or whole of the retina. The intervening space between these layers is filled with a fluid, the nature of which is either physiological or pathological.

Aetiology

Two theories are held concerning the cause of simple detachment of the retina; they are the "mechanical theory" and the "diffusion theory."

The mechanical theory maintains that simple detachment of the retina takes place under one or several of the following conditions:

- (a) When the intra-ocular pressure in front of the retina falls below the normal.
- (b) When the pressure behind the retina is increased.
- (c) When adhesions between the vitreous and the retina contract and pull on it.

Under normal conditions the retina is attached at the papilla and at the ora serrata, the remaining part lies in contact with the choroid, but is not attached to it. Elastic tissue is present in the sclera and choroid, but absent in the retina. In myopia the antero-posterior diameter of the globe increases, the intra-ocular pressure falls, and the retina being an inelastic structure may become detached at a point between the papilla and the ora serrata. The intra-ocular pressure falls when the output of aqueous humour is defective. This defect is due to an interference with the normal activity of the ciliary processes, either from inflammation of the uveal tract, or from atrophy of the circular ciliary muscle and ciliary processes in myopes.

Primary degeneration of the vitreous, perforating wounds of the globe, and perforating corneal ulcers, by lowering the intra-ocular tension, dispose to retinal detachment. A subretinal haemorrhage arising from a contusion of the globe, and exudates in patients suffering from choroido-retinitis, may produce sufficient local pressure to cause a detachment.

Leber and Nordenson have worked on the vitreous of animals, and have discovered that disease of the choroid or ciliary body produces changes in the vitreous. The fibrillae of the vitreous become thickened and tortuous, and the cell content increases. The vitreous shrinks and becomes detached. The detachment is funnel-shaped; the neck of the funnel is at the papilla and the wide part at the equator; and the space between the hyaloid membrane and the retina is filled with fluid. Further dragging on the retina causes the retina to tear. Fluid from the vitreous then enters the tear and floats up the retina.

The diffusion theory is based on the presumption that the retina acts like the animal membrane of a dialyser. The retina separates two physiological fluids; the fluid in the tissue spaces and lymphatics of the choroid possesses colloidal properties, whereas the vitreous is crystalloid in nature. The supporters of this theory believe that the smaller crystalloid molecules can pass through the retina by a process of diffusion.

Oliver²⁰ has analysed the vitreous and found that 98·4-98·6 per cent. is water, and the remainder is composed of salts, extractives, and a trace of protein and nucleoprotein. Scherl²⁶ estimated the albumen content of a transudate in acute choroiditis as 8·99 per cent., a figure about twice as high as the normal albumen content

of the fluid in the lymphatic vessels. Halliburton¹⁴ confirms this fact when he states that "the fluid effused from a serous membrane in cases of inflammation contains a higher percentage of proteid material than fluid effused as a result of pressure under normal physiological circumstances." A transudate from blood vessels is very rich in proteins, and these upset the normal balance of osmotic pressure in the lymph spaces. Scherl²⁶ describes a specimen of subretinal fluid, collected from a patient in whom no retinal tear was discovered. The report states that the colour of the fluid is greenish-yellow and the specific gravity and albumen content higher than in serous effusions. These facts suggest that in composition the subretinal fluid does not resemble the vitreous. Nordenson, however, believes that vitreous enters the subretinal space through a tear in the retina. He has examined 119 patients suffering from simple detachment of the retina and has seen retinal tears in 38 per cent.

The following is a summary of the causes of simple detachment of the retina :—

(1) *Trauma.* Concussion of the globe, subretinal haemorrhage, perforating injuries, perforating corneal ulcers, and occasionally operative procedures on myopes, cause retinal detachment.

(2) *Progressive myopia* is accompanied by softening of the sclera, and compression of the globe by the extra-ocular muscles; the shape and length of the eye is altered, and the retina is subjected to abnormal stresses, culminating in detachment.

(3) *Inflammation.* Irido-choroiditis, panophthalmitis, and retinitis by producing exudates and changes in the vitreous may cause detachment of the retina. Hann¹³ and Knaggs¹⁶ have described two cases of bilateral retinal detachment occurring in patients suffering from albuminuric retinitis during pregnancy. Recovery was complete in both patients. Adamuk, Benedict, and Mussey¹ have also recorded similar cases which recovered after the termination of labour.

(4) *Congenital detachment of the retina.* Fernandez¹¹ has seen bilateral detachment of the retina in two brothers; the detachments were present at birth and persisted afterwards. He suggests that congenital syphilis is a cause of this condition, but he was unable to make investigations in this particular case.

George S. Lachman¹⁷ has reported a case of bilateral retinal haemorrhage causing detachment in a new born child. At the age of three months it was supposed that the child was suffering from retinal neoplasms in both eyes. Both eyes were enucleated, and on examination the retina was found to be separated from the choroid by a mass of blood serum. There was no evidence of tumour

formation. J. Komoto¹⁵ has described 3 cases of retinal detachment associated with coloboma of the iris and choroid, in one family.

Dr. Komoto points out the hereditary influence in these patients, and insists that such people should not marry owing to the danger of transmitting this ruinous condition to posterity.

(5) *Parasitic*, due to cysticercus.

(6) *Idiopathic*. Czerny⁸ found that continuous concentration of the solar rays upon the retina of frogs, birds, and certain mammals caused a disintegration of the retinal pigment epithelium. The layer of rods and cones becomes separated from the pigment epithelium. Streams of leucocytes appear among the debris of the broken retinal elements and thereby augment the subretinal fluid. Czerny submits this as a possible cause where no other can be found.

An analysis of the 100 case reports shows the following points of interest.

(i) *Age incidence.*

10—20 years of age	2 cases.
20—30 " " "	20 "
30—40 " " "	16 "
40—50 " " "	20 "
50—60 " " "	27 "
60—70 " " "	13 "
over 70 " " "	1 "

In one patient, the age was not recorded.)

(ii) *Sex incidence.*

Males 62 per cent.
Females 36 per cent.

- (iii) *Onset of the detachment.*
 Sudden in 52 per cent.
 Insidious in 42 per cent.
 History of trauma in 16 per cent.
 Previous eye trouble in 24 per cent.
- (iv) *Refractive errors.*
 Myopia 42 per cent.
 Hypermetropia 11 per cent.
 Emmetropia 11 per cent.
 (The refractions of the remaining cases were unrecorded.)
- (v) *Intra-ocular tension.*
 Raised above the normal in 5 per cent.
 Below the normal in 8 per cent.
- (vi) The *lens* was hazy, or showed central and peripheral opacities in 20 per cent.
- (vii) *Vitreous opacities* were present in 47 per cent ;
 Retino-hyaloid adhesions in 1 per cent ;
 Gross pathological changes in 6 per cent.
- (viii) *Site of detachment.*
 Upper half of retina in 8 per cent.
 Lower half of retina in 32 per cent.
 Total detachment in 9 per cent.
 Detachment in supero-temporal quadrant in 13 per cent.
 Detachment in infero-temporal quadrant in 25 per cent.
 Detachment in supero-nasal quadrant in 3 per cent.
 Detachment in infero-nasal quadrant in 10 per cent.
- (ix) Retinitis was present in 3 per cent.
- (x) The choroid was diseased in 28 per cent.

I have omitted to mention the incidence of occupation in retinal detachment. This is because the majority of the patients, concerning whom these statistics have been made, belong to the hospital class. Detachment of the retina is said to be more prevalent among sedentary workers who are exposed to eyestrain, *i.e.*, students, writers, and compositors. The statistics given by Poncet²² in his report to the Ophthalmological Society of Paris on May 3, 1897, closely resemble these.

- (i) *Age incidence.* The numbers increase between 40 and 70 years of age, the maximum is at 60.
- (ii) *Sex.* Males 62 per cent. Females 38 per cent.
- (iii) *Refractive errors.* Myopia 37 per cent.

(iv) *Other causes :*

Choroiditis 16 per cent.

Trauma 19 per cent.

Various 28 per cent.

Treatment of Simple Detachment of the Retina

General principles of treatment.—At the present time the therapeutic measures adopted in the treatment of this condition are regarded with almost universal scepticism, so that detachment of the retina, both to the laity and the medical profession, maintains its unenviable reputation of being incurable. Complete re-position of the detached portion of the retina, and restoration of function in this part is the aim and object of treatment. Re-position of the retina to the pigment epithelium is recognised by the return of a uniform red reflex, the disappearance of the characteristic fundus changes, and the restoration of the visual acuity and the visual field to the normal. It may be partial or complete.

The collection of subretinal fluid separating the detached retina from the pigment epithelium is one of the principal factors preventing the co-aptation of these two layers. The choroid exercises very feeble absorptive powers compared with other vascular membranes, so that the subretinal fluid is absorbed very slowly, and in some cases not at all. Meanwhile the detached part of the retina undergoes degenerative changes, and becomes converted into a fibrous structure covered with albuminous droplets, and incapable of functional restoration. Meyer Weiner³⁴ believes that the retinal blood vessels exert a contractile force and thereby prevent re-position of the detached part. Retino-hyaloid adhesions may also prevent the detached part from re-assuming its normal position.

The fundamental principle of treatment is to cause co-aptation of the detached retina and the choroid by establishing drainage of the subretinal fluid, and if necessary, by dividing any fibrous tissue bands between the vitreous and the retina.

There are two methods generally adopted for the purpose of draining the subretinal fluid :

(1) To increase the absorptive and excretory powers of the body by the administration of diaphoretics and diuretics, *e.g.*, hot air baths, purgatives, injections of pilocarpine, salicylates, and the local injection of hypertonic saline solutions into Tenon's capsule.

(2) Operative procedures such as scleral puncture, scleral trephine, and scleral puncture with permanent drainage by the introduction of horse-hair or gold wire.

To induce cohesion between the retina and the choroid attempts have been made to set up inflammation by applying a cautery to the sclera over the site of the detachment, or puncturing the

detached portion of the retina in several places, or by electrolysis, and by the injection of iodine in glycerine into the subretinal space.

I propose to describe the treatment of the simple detachment of the retina under the following headings :—

- (1) Prophylactic.
- (2) Conservative.
- (3) Operative.

(1) *Prophylactic treatment* is directed towards the prevention of progressive myopia, and the onset of irido-cyclitis. Nordenson has collected statistics from various observers and has stated that out of 1,100 cases of spontaneous detachment of the retina 80 per cent. were myopes, and 50 per cent. of these were over the age of 50. In progressive myopia the globe lengthens and the vitreous liquefies and shrinks. In such cases the refractive error should be corrected fully. Young persons must wear the full correction constantly, and elderly persons the full correction for distance, with an adequate deduction for near work. In order to avoid excessive convergence near work must not be brought closer than 33 cms. Over-action of the internal recti during convergence compresses the sclera and thereby lengthens the globe. Particular attention must be paid to the following points in ophthalmic hygiene.

- (i) The source of illumination must be placed behind and to the left of the patient, and must be of adequate intensity.
- (ii) Reading and writing must be reduced to the minimum amount possible.
- (iii) Close work must be engaged in for short periods only.
- (iv) Recreation of a gentle nature is recommended, but games which are likely to cause jolts, blows, or excessive muscular strain are forbidden.

The error of refraction must be corrected and the patient's general health supported.

(2) *Conservative treatment.* Some general indications for guidance are necessary before deciding on the course of treatment suitable for each particular case. The aetiology and the condition of the vitreous, retina, and choroid play an important rôle in this decision. Patients who show certain pathological phenomena are, in my opinion, better treated on conservative lines. These are as follows :—

- (i) Those patients who show gross pathological changes in the vitreous, i.e., numerous contractile bands, vascular membranes, large haemorrhages.
- (ii) Patients suffering from retinitis and choroiditis.

- (iii) Patients who have retinal tears, and those in whom the intra-ocular tension is very low.
- (iv) All recent cases of retinal detachment should be treated on conservative lines for 2—3 weeks as a preliminary to operative treatment.

It is essential to begin treatment early. If treatment is delayed the retina degenerates and restoration of function becomes improbable. The essentials of conservative treatment are :—

(a) *Absolute rest in bed.* The position in which the head is placed varies with the site of detachment, *i.e.*, if the detachment is in the region of the posterior pole the head must be immobilised in the horizontal position; if at the periphery and in the lower half of the retina, the head must be raised to the requisite angle. The patient must be fed, washed and nursed without moving his head. The bowels must be carefully regulated, and any physical exertion avoided. Any tendency to cough or sneeze must be checked, if necessary, by sedatives.

(b) *Therapeutics.* To promote absorption of the subretinal fluid and to stimulate the excretory organs, hot air baths, saline purges, injections of pilocarpine hydro-chlorate, iodides, and salicylates are administered in suitable doses.

Pilocarpine hydrochlorate is given hypodermically in 0.125 gr. to 0.5 gr. once daily. Certain patients cannot tolerate this drug, since in them it produces vomiting, prostration, and cardiac failure. It must therefore be used with caution. Iodides in the form of potassium iodide gr. v—x are administered thrice daily combined with liq. hydrarg. perchlor. de Schweinitz favours sodium salicylate gr. x—xx four hourly. Conservative treatment must be carried out for four to six weeks before the patient is allowed to sit up in a chair and gradually resume activities of a gentle nature. In spite of careful treatment, a large number of cases, varying from 25—35 per cent. become worse or recur.

(3) *Operative treatment.* The surgical history of simple detachment of the retina.

1860—70. Ware and Sichel were the first to suggest scleral puncture and the evacuation of the subretinal fluid. Kittle of Vienna was the next to pursue this practice. A little later Sir William Bowman, von Graefe, Alt, and Secondi performed the operation of discission of the detached portion of the retina, to allow the subretinal fluid to flow into the vitreous. This operation was soon abandoned owing to lack of success. de Wecker and Masselon then introduced the operation of scleral puncture at the site of detachment, and passed a gold wire drain into the subretinal space. This operation was a failure and was quickly abandoned.

1872. Shortly after this Wolfe and Snell²⁹ performed meridional sclerotomy, puncturing the sclera in two places, and the detached part of the retina in several places.

1890—95. de Wecker and Chevallereau applied a cautery to the sclera at the site of the detachment. About this time Schoëler recommended the injection of a solution of iodine in glycerine into the sub-retinal space. The results of this practice were disastrous and it has been abandoned.

1891. Deutschmann divided cicatricial bands in the vitreous and at the same time injected the vitreous of rabbits in order to increase the bulk of the patient's vitreous. A little later Birch-Hirschfeld modified this operation by aspirating the subretinal fluid, then puncturing the detached part of the retina and injecting the aspirated fluid into the vitreous. A severe inflammatory reaction followed these procedures, and owing to the rapid absorption of the injected fluids, the vitreous returned to its previous bulk in the course of a few hours. The vitreous seldom adheres to the retina by a single band, but more often a dense cicatricial mass and multiple adhesions are found. The operation of division of one band (should one alone exist) is beset with many difficulties. It is essential to operate under ophthalmoscopic examination, and the technical difficulty of controlling the knife and at the same time obtaining a clear view through media already diseased, is obvious. Also in attempting to sever the fibrous band the retina is dragged upon and the detachment thereby rendered more extensive.

1897. Coppez⁶ performed iridectomy, according to the modified operation of Wolfe. Out of 18 patients so treated, one was cured, in five the result was disastrous, and the remainder were partially successful. Scleral trephining has been practised by several English and American ophthalmic surgeons. The sclera is trephined over the site of the detachment, the choroid exposed, and the subretinal fluid evacuated. The trephine hole is left as a permanent drain. Unfortunately this opening soon becomes occluded by a mass of fibrous tissue, and drainage then ceases.

Müller's operation of choroidodialysis has been tried by several continental surgeons. The scleral laminae are divided layer by layer down to the choroid and a spatula is introduced between the sclera and the choroid, and made to pass in an oblique direction, finally it punctures the choroid at the site of retinal detachment, and is then withdrawn. I have been unable to obtain any information concerning the results of this procedure. Müller has also practised resection of the sclera to diminish the size of the globe, and to lower the tension of the choroid in cases of myopia. The technique of this operation is as follows:—An incision about 20 mm. long is made above the insertion of the external rectus

muscle. Two sutures are passed into the external rectus and the muscle divided between them. The superficial layers of a band of sclera 20 mm. $\times$ 10 mm. from the insertion of the external rectus muscle to the equator, are dissected away. Five sutures are then passed through the edges of this strip and retracted whilst the deeper layers of the sclera are separated from the choroid. The scleral sutures are then tied.

1896. *Electrolysis* was tried by Montgomery, Snell, Terson, Motais, and others. The sclera was punctured by a platino-iridium needle and this needle was pushed through the sclera and on into the subretinal space. A current of five milli-amperes was passed for one minute. The operation is very painful and the post-operative reaction intense. The results are not satisfactory. Montgomery¹⁹ has reported on four cases, three of which showed no improvement, and one became worse. In two of these cases the pathological changes in the vitreous increased, and in one case the vision was lost entirely. Snell³⁰ treated three patients, one recovered, one improved, and the other showed no improvement. Terson reports on twelve cases, one recovered but the recovery lasted for nine months only; five were improved for 2—9 months, but subsequently became worse; and of the remaining six no account is given. Motais states that in the eleven cases which he treated, there were three ameliorations, and two cures, but no account is given of the six other cases.

Subconjunctival injection of hypertonic saline. Of recent years attention has been turned towards the treatment of detachment of the retina by the injection of hypertonic saline under the conjunctiva or into Tenon's capsule over the site of the detachment. The object of this procedure is to drain subretinal fluids by osmosis; the choroid and sclera are assumed to act as dialysing membranes. In my opinion this hypothesis is fallacious. First, the subretinal fluid possesses a high albumen content, and is therefore of a colloidal nature, whereas the injected saline is a crystalloid solution. This being the case, the larger colloid molecules will not pass by osmosis through the choroid and sclera to reach Tenon's capsule. Secondly, the thickness and the dense fibro-elastic structure of the sclera will afford mechanical difficulties to the passage of molecules between the two fluids. Even if we assume that water passes from the subretinal fluid through the vascular layers of the choroid and then through the sclera to reach the crystalloid solution injected into Tenon's capsule, it is probable that this resulting loss in the volume of the subretinal fluid would be only temporary, for lymph or aqueous would pass into it again either from the choroid or vitreous, or both. It is likely that the injected saline is absorbed by the blood vessels and lymphatics draining Tenon's capsule and the surrounding soft orbital tissues.

de Wecker has injected a mixture of gelatin 3.5 parts and physiological saline 100 parts.

de Schweinitz has reported a few favourable results by injecting 0.5 to 1.9 c.cs. of saline 4—5 per cent. after puncture.

A. Darier⁹ has treated cases of detachment of the retina in myopes by subconjunctival injection of acoinated gelatinized serum and saline. If there is no improvement after two injections he advises scleral puncture.

At St. Bartholomew's Hospital between 1923 and 1927 twelve patients were treated by injecting a sterile solution of sodium chloride 5 per cent. alternately with sodium citrate 5 per cent.; novocaine 2 per cent. was added to both solutions. Every third day five to ten minims of these solutions were injected into Tenon's capsule over the site of the detachment. The injection of these solutions did not provoke any reaction, but the results of this treatment were far from satisfactory. Of the twelve patients treated at St. Bartholomew's Hospital only one was improved, the remaining eleven showed no improvement at all. In one patient the pathological changes in the vitreous increased, and in another the lens became opaque.

1923. Further attempts were made to improve the technique of scleral puncture. Hitherto the majority of ophthalmic surgeons, when performing this operation, used to plunge a Graefe knife through the sclera at the equator of the globe, and over the site of the detachment, give the knife a quarter or half turn, pause a second to allow the subretinal fluid to drain, and then withdraw the knife and apply a pad or bandage. Several surgeons have performed double scleral puncture by passing the knife into the subretinal space, then turning it back through the choroid and transfixing the sclera again at a point about 10 mm. from the site of the initial puncture. The knife was then withdrawn. G. Sourdville³⁰ advises multiple scleral puncture. A Graefe knife is entered at the equator of the globe and plunged 10—12 mm. towards the centre of the eyeball. This is repeated in three or four situations over the detachment, the blade of the knife being rotated to evacuate the subretinal fluid. 1—2 c.mm. of an aqueous solution of mercury cyanide 1/1,000 together with a few drops of 5 per cent. cocaine is injected under the conjunctiva at the site of puncture. Sodium chloride 6 per cent. is injected under the conjunctiva once a week after the post-operative chemosis has subsided. During two and a half years Sourdville has treated 35 eyes in 30 patients. Sixteen of these showed recent detachments, nine of which were cured permanently, and one improved. Out of eighteen patients, in whom the detachment was of long standing, nine were improved.

In 1923 Meyer Weiner³⁴ performed the operation of posterior sclerotomy with permanent drainage. His technique is as follows :

—Two trephine openings, about 1 mm. apart, are made over the site of the detachment. Two or three strands of horse hair are passed on a curved needle through one trephine opening. The needle is made to pierce the choroid, traverse the sub-retinal space, and to pass through the choroid again and out through the other trephine opening. About 1.5 mm. of horsehair is allowed to project from each trephine hole.

Of six patients so treated, two showed complete re-position of the retina, and four became worse. This treatment is inadequate where vitreous bands are present and where the subretinal space is filled by a dense organizing substance.

September, 1923. Bettremieux² described the operation of non-perforating peri-corneal sclerectomy. The object of this operation is to improve the intra-ocular nutrition by making an anastomosis between the subconjunctival peri-corneal vessels and the intra-scleral plexus of veins. Bettremieux maintains that myopic ectasia and anterior choroiditis are due to nutritional disorders of the uveal tract. The technique of this operation is briefly as follows:—Under cocaine anaesthesia a conjunctival flap, 15—18 mm. wide, is dissected from the limbus. The sclera is bared in the region of the limbus, and is shaved so as to make a groove 15 mm. × 1 mm. The conjunctival flap is moulded into the groove, and becomes adherent to it. The operation can be repeated at other parts of the limbus.

1929. At the International Congress of Ophthalmology held in Amsterdam Professor J. Gonin described his method of treating simple detachment of the retina. He emphasized the importance of locating accurately a tear in the retina where such exists. Over the site of the retinal tear he makes a puncture through the sclera and choroid with a thermo-cautery and sears over the hole in the retina, with the object of preventing the passage of vitreous into the subretinal space and of provoking an adhesion between the retina and choroid. The fundus paintings of cases so treated show favourable results which are remarkable. It is obvious that this operation must be fraught with great technical difficulties.

It has been said that the success of any operative procedure is in the inverse ratio to the number of operations described and practised for that particular condition, and the operative treatment of retinal detachment is no exception to this.

Scleral puncture, the application of the galvano-cautery to the sclera, electrolysis, and the injection of hypertonic saline have enjoyed a more prolonged trial than other methods. Deutschmann's operation for dividing cicatricial bands in the vitreous, Schöler's injection of iodine in glycerine, and drainage of the subretinal space by gold wire have been condemned as both useless and dangerous.

SIMPLE DETACHMENT OF THE RETINA

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In the table given below the results of treatment are classified as being favourable and unfavourable. The cases yielding favourable results have been subdivided into those which recovered completely, and those which improved. Complete re-position of the detachment and full restoration of the visual acuity and visual fields I have regarded as recovery; partial re-position of the retina, and partial restoration of the visual acuity and visual field as improvement. The unfavourable results are subdivided into cases which showed no improvement, and cases which became definitely worse. In the patients who became worse the detachment increased, the visual acuity was diminished or entirely lost, the lens became opaque, and the pathological changes in the vitreous advanced.

(N.B. Certain patients improved for a time, but subsequently the detachment recurred; these have been classified as unimproved and worse.)

Treatment.	No. of cases treated.	Favourable		Unfavourable.	
		Re-covered.	Im-proved.	Unim-proved.	Worse.
Conservative treatment ...	35	17%	40%	20%	23%
Scleral puncture ...	40	17½%	20%	17½%	45%
Hypertonic salines ...	13	—	7½%	92½%	—
Electrolysis ...	7	14%	14%	57%	14%
Scleral cauterization ...	2	—	—	50%	50%
Scleral puncture and division of vitreous bands	3	—	—	100%	—
Total ...	100	14%	24%	34%	28%

The statistics regarding the results of treatment by electrolysis, scleral cauterization, and Deutschmann's operation of dividing cicatricial bands in the vitreous are unreliable on account of the small number of cases which I have been able to collect. Of the few described above the results appear to be disastrous.

The results obtained by the injection of hypertonic salines are unsatisfactory. Detachment is liable to recur soon after treatment has ceased, or at a later date. Of the cases reported in the appendix only 38 per cent. have been followed up for a period varying from one to three years after discharge from hospital. It is

probable that many more recurrences and subsequent disasters occur than we know of.

The prognosis is bad for the majority of patients, especially when the affected eye has been previously damaged by disease or injury, or when the detachment has recurred. In myopes the prognosis is worse than in emmetropes and hypermetropes. The prognosis is more favourable in patients where the detachment is associated with albuminuric retinitis of pregnancy, or where the detachment is traumatic in origin, especially if prompt and efficient treatment is carried out early. The effect of conservative and operative treatment on the prognosis varies with the type of case selected for each respective treatment. Patients suffering from albuminuric retinitis of pregnancy with detachment of the retina recover after two or three weeks' conservative treatment. Also some cases of detachment due to trauma will recover after two weeks' conservative treatment, while with others it is necessary to perform scleral puncture in order to obtain a satisfactory result.

Conservative treatment must always be adopted where gross pathological changes are present in the vitreous, retina, or choroid. Operative measures in such cases are frequently disastrous.

It is interesting to compare these results with those of other observers. Leber states that re-attachment of the retina takes place in 8.5 per cent. of cases, and that moderately useful vision is restored in 3—6 per cent. Uhthoff's statistics show that 61 per cent. of cases of retinal detachment are myopes. He has collected 351 cases of permanent re-attachment. 45 per cent. were due to conservative treatment, 24 per cent. to operative treatment, and 31 per cent. recovered spontaneously without any treatment. Darier⁹ gives 16.27 per cent. recoveries, and 25.55 per cent. improved by his method of injecting acoinated gelatinized serum under the conjunctiva.

Summary

Treatment :

1. *Early* treatment is most important.
2. Conservative principles must be adopted for two or three weeks. If at the end of this time the retina is not re-attached, operative measures are indicated if the case is suitable for such. Pathological changes in the vitreous and the uveal tract, or a perforating injury, are contra-indications to an operation.
3. All the operative measures adopted for this condition are unsatisfactory, but scleral puncture and drainage of the subretinal fluid afford better results than any of the others.
4. Detachment frequently recurs two or three days after scleral puncture. The operation should be repeated a week or so later.

5. On discharge from hospital the patient must be instructed as regards prophylactic treatment, *i.e.*, he must avoid strenuous exercise, jolts, and blows.

Prognosis:

1. The prognosis is always grave.
2. It is more favourable in patients suffering from detachment due to trauma, without a perforating injury, and in cases of detachment associated with albuminuric retinitis of pregnancy.
3. It is unfavourable in cases where the eye is grossly diseased as a result of an old perforating injury or inflammation, and where there has been a previous detachment.
4. The results of treatment are less favourable in myopes.

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DEFECTIVE SIGHT AND SIGHT EDUCATION

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STRABISMUS is described in a very well known text book on diseases of the eye under a section entitled " Disorders of Motility of the Eye." The word itself is defined as " a general term applied to all those conditions in which the visual axes assume a position relative to each other different from that required by the physiological conditions." When both eyes are directed to the same object, and are seen to follow it when it moves, it is certain that both eyes see it, and that they are in their true physiological position. Thus the physiological conditions of normal human sight are brought about when both eyes fix the same object. The condition of sight in concomitant strabismus is that only one eye fixes the object looked at, and the other does not fix it. The disorder of motility is, therefore, *the failure of a movement* which should occur under normal conditions, that is, the movement of fixation fails in one eye or in the other.

Further, although the power to see with each eye may exist, and in many cases of concomitant strabismus the sight with each eye separately is good, *the power to see with both eyes at the same time is absent*. This is a matter for observation, not for discussion. Let any child with concomitant strabismus look at an object, a pencil, for example, and ask him how many pencils he sees. His answer is " one." *The eye which sees the pencil, fixes it. The eye which does not fix it, does not see it*, for there is no double vision,