

PHOTO COAGULATION IN THE MANAGEMENT OF RETINAL DISORDERS—A PRELIMINARY REPORT

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INTRODUCTION

Photo Coagulation as a means of treatment in ophthalmology has been applied to great advantage for more than 15 years. The burst of enthusiasm that accompanied its introduction has in recent years been tempered by the subsequent experiences of its many exponents. Certainly more refinements have been developed. More portable, more powerful and flexible instruments are available and with these a more knowledgeable application of the instruments that are now marketed.

TYPES OF PHOTO COAGULATORS

Basically there are two types of Photo coagulators:—

1. Xenon Arc Photo Coagulator
 - (a) *Portable* e.g. Log 2 Clinitext *Fixed*
 - (b) (*Heavy Duty*) e.g. Zeiss—ophthalmoscope slit lamp.
2. Laser Photo Coagulator
 - (a) *Ruby* (original)—now obsolete.
 - (b) *Argon*—direct, indirect and slit lamp models.

Laser is the acronym for Light Amplification by Stimulated Emission of Radiation. The Argon Laser emits radiation in single wave form of several wave lengths of which the most important are 5145 A, 4880 A effectively absorbed by blood and melanin. It's greatest advantage is that it can be accurately focussed.

The Advantages of the Argon Laser over the Xenon Arc Photo Coagulator are several:—

1. It can do what the Xenon Arc Photo Coagulator does and occasionally more, except for tumours, retinoblastomas and angiomas.
2. It is more effective against neovascularization and proliferative retinopathy and particularly so for intravitreal vessels.
3. It can treat lesions close to the macula and optic disc because of its most precise focussing and its much smaller size of coagulations, about 50 microns ($\frac{1}{2}$ the size of a retinal vein).
4. It is selectively absorbed by Haemoglobin and therefore very good for micro-vascular abnormalities.

Its disadvantages compared with the Xenon Arc Photo Coagulator are not insignificant:—

1. It is much more expensive.
2. It cannot treat retinal tumours, retinoblastomas, angiomas and is perhaps not quite as good for anterior segment lesions.

USES OF PHOTO COAGULATION

TABLE I

APPLICATION OF PHOTO COAGULATION

Anterior Segment

1. Glaucoma
2. Peripheral Iridectomy
3. Corepaxy
4. Iris Tumours
5. Iris Cysts

(Xenon probably better than Laser)

TABLE II

APPLICATION OF PHOTO COAGULATION

Posterior Segments

1. Tumours—Retinoblastomas, melanomas, vascular tumours, metastatic Ca.
2. Degenerations.
3. Retinal detachments.
4. Vascular proliferations.
(ICR)
5. Oedemas (macular—senile, diabetic)
6. Diabetic Retinopathy.
7. Branch vein thrombosis.

Photo Coagulation can be used to treat both lesions of the Anterior as well as the posterior segment of the eye. At first its main use was for retinal detachment but with the development of the more portable ones and as well as the Argon Laser in recent years, it has been applied successfully to treat a varying number of other lesions, especially of the posterior segment.

Worthwhile results have been obtained in the treatment of:—

- (a) Diabetic Retinopathy.
- (b) Senile Macular Degeneration.
- (c) Central serous retinopathy.

(a) *Diabetic Retinopathy*

4 cases of intra retinal (background) retinopathy and 3 cases of proliferative retinopathy had been treated by the authors.

In the 4 cases of intra retinal retinopathy, Xenon Arc Photo Coagulation showed an improvement in 3 of the cases in visual acuity by 1 to 2 lines. Improvement took several months to occur. In the 3 cases of proliferative retinopathy, photo coagulation was used to seal off bleeding areas and to prevent further proliferation. Visual results as expected were not as good but no deterioration occurred.

From the experience in other reports, the following guidelines may be used in making a decision regarding the use of photo coagulation:—

1. No treatment of isolated micro-aneurysms and isolated hard exudates, unless they are in the macular or para-macular areas with presence of macular oedema, or are likely to cause macular oedema.
2. Once maculopathy is present as evidenced by a drop in 2 lines of visual acuity, treatment may be started. Macular oedema is reversible.
3. Proliferative diabetic retinopathy should be treated at the first evidence of neovascularization. The Argon Laser is particularly good for managing tufts of new blood vessels.
4. If Visual Acuity is less than 3/60 with heavy deposits of hard exudates over several years and or with large areas of ischemia, there appears to be no point in treatment with Photo-coagulation.
5. All sites of capillary leakage are treated as long as they one-fifth disc diameter away from the fovea.
6. Exudates and haemorrhage are not treated *per se*, unless they are over a cluster of micro-aneurysms or a microvascular shunt or if there has been evidence of bleeding (preretinal) in these areas.

(b) *Senile Macular Degeneration*

In this condition, the retina and pigment epithelium are elevated by serous fluid, which arises from the sub pigment epithelial fibrovascular tissue originating from the choroid. A change in the state of the pigment epithelial cells causes the formation of an accumulation of amorphous material in Bruch's membrane (equal Drusen's), and this seems to disrupt the collagen fibres of the inner collagen layer of Bruch's membrane. These fibres are inserted into the basement membrane of the pigment epithelial cells and are responsible for the strong attachment of the pigment epithelium to the choroid. Age probably associated with genetic factors causes this change and a spontaneous detachment of the pigment epithelium occurs. This is the initial morphological change in some macular degenerations. This is also

the avascular stage. Sometimes they resolve spontaneously, though most are followed by invasion of the sub pigmentary epithelial space by choroidal blood vessels, producing a vascular disciform lesion with exudation which perpetuates the detachment. Continued growth of proliferative vascular tissue is accompanied by haemorrhages and exudates.

Criteria for Treatment

1. Avascular stage—detachment of pigment epithelium with some exudation.

In this stage, photo coagulation has been recommended in a continuous line near the periphery of the detachment and also in a coarse grid over the central portion, guided by angiograms. (fluorescein).

2. Vascular stage—Abnormal vessels as demonstrated by fluorescein, or blood, or large amounts of exudate seen in the sub retinal and sub pigment epithelial space.

Here, heavy, confluent photo-Coagulation has been recommended on the vascular tissue but not under the fovea. Repeated applications in stages on different occasions may be necessary.

Photo Coagulation in avascular lesions causes the retina to flatten and the exudates to be absorbed. There is improvement of visual acuity. How long it will remain so remains to be seen. How flattening occurs is not known. However reports in fairly large series have described encouraging results, both in avascular and vascular lesions. It is to be noted that although photo coagulation improves the visual prognosis in respect of the original lesion, it is unlikely it reduces the risk of the disciform lesion arising in the same eye elsewhere.

Therefore, it does not influence the basic disease process and that even after treatment, the patient has a progressive fundus degeneration due to aging.

In the 3 cases treated by the authors all 3 have shown improvement. In one case the improvement was quite good from 6/60 to 6/12 partly. Only one eye was treated in each case.

(c) *Central Serous Retinopathy*

This is a very common retinal disorder and in most cases resolves spontaneously. However on occasions cases do occur which tend to show a gradual decrease in central visual acuity with no episodes of improvement, despite medication. In these cases the basic pathology is believed to be in the choroid, with later involvement of the retina producing a chorio-retinopathy and a serous detachment of the pigment epithelium.

Although no set rules have been laid down the following criteria have been observed in our selection of cases for photo-coagulation:—

1. multiple recurrences
2. progressive V.A. loss to less than 20/40 (6/12)

3. Angiography reveals fluid
4. only after a period of conservative treatment and certainly before oedema leads to cyst and hole formation.

All these 4 criteria must be fulfilled.

4 cases, two unilateral and 2 bilateral were treated by the authors in this manner and there has been subsequent improvement in all six eyes.

Photo coagulation was applied in all cases to the extra foveal area, taking care to avoid larger retinal veins draining the area.

CONCLUSION

In selected cases, photo coagulation, backed up

by fluorescein angiography, can be used to successfully treat posterior segment conditions other than Retinal Detachment e.g. diabetic retinopathy, senile maculopathies and central serous retinopathy.

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