

## Section of Ophthalmology

President L P Jameson Evans FRCS

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### Papers

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#### The Assessment and Treatment of Endocrine Exophthalmos

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An ophthalmic endocrine clinic was established in the Tennent Institute five years ago to handle the increasing number of patients with endocrine disease having eye complications requiring assessment and treatment. The Tennent Institute is the Glasgow University Department of Ophthalmology and acts as the Eye Department of the Western Infirmary, but contains many facilities which are established on a regional basis. This Institute is therefore a convenient site for such a joint clinic to which patients are referred from other medical and endocrine departments or from other hospitals where the primary diagnosis has been made and general investigation and treatment undertaken.

The number of patients seen and their diagnosis vary, depending largely on investigations being made and clinical research undertaken and also on the current interest of referring departments. Of the patients seen during 1968, 65% had diabetes mellitus, 22% had thyroid disease and 6% had pituitary disease. All of the patients attending this clinic are selected but patients with metabolic diseases other than diabetes mellitus are in general not seen as they attend other clinics within the Tennent Institute. A small proportion of the patients seen do not have manifest ocular complications of endocrine disease as some investigations are made to detect the earliest ocular signs of endocrine disease including diabetes mellitus (Bronte-Stewart *et al.* 1970). This brief report deals with some of the investigations made into patients with thyroid disorders.

#### *Effects of Total Thyroid Ablation on Exophthalmos*

Bauer & Catz (1966) reported that they had been successful in treating a group of patients with malignant exophthalmos by giving large therapeutic doses of radioactive iodine to ablate the thyroid gland. In all of their patients there was marked improvement in the infiltrative changes of ophthalmopathy and the proptosis was improved. Bauer & Catz (1963) and others had previously suggested that functioning thyroid tissue is necessary in the pathogenesis of progressive exophthalmos and probably for the presence of long acting thyroid stimulator (LATS). Despite previous reports and our personal experience that total thyroid ablation, whether by surgery or by radioactive iodine, has no effect on established exophthalmos, total thyroid ablation can be justified on theoretical grounds since some observers have found significantly higher levels of LATS in thyrotoxic patients with the eye signs of Graves' disease than in those without eye complications; in view of this, and taking into account the enthusiastic early reports on the effect of total thyroid ablation in reducing exophthalmos, we instituted a pilot study to assess the immediate and long-term effects of the therapy.

We selected 9 patients for total thyroid ablation with radioactive iodine. The patients selected had all been initially hyperthyroid and had thyroid disease for varying lengths of time (Table 1). There were 7 women and 2 men. The ages ranged from 39 to 57 years. They all had bilateral exophthalmos and the duration of exophthalmos in the first eye involved ranged from five months to twenty years. As this was undertaken as a pilot study, a range of patients was selected: at the same time the Medical Research Council was conducting a controlled trial into the treatment of the exophthalmos of thyrotoxicosis by total

**Table 1**

Nine patients selected for total thyroid ablation with radioactive iodine

Sex	Age	Duration of exophthalmos	1966 Status	Previous therapy	1966 Ablation (mCi)	1969	
						Exophthalmos (mm) ●	Symptoms
F	39	3 years	Toxic	Methyl thiouracil, <sup>131</sup> I	80	0	-
F	44	16 months	Euthyroid (T)	Carbimazole	100	+1	-
F	45	7 years	Euthyroid (T)	Surgery, <sup>131</sup> I	115	(+2.5) ■	Worse
F	46	20 months	Toxic	Carbimazole	100	-1.5	Improved
F	51	3 years	Euthyroid (T)	<sup>131</sup> I	100	+2	-
F	53	7 years	Toxic	Potassium perchlorate, <sup>131</sup> I	80	-0.75	Improved
F	56	20 years	Toxic	Surgery	180	0	Improved
M	48	5 months	Euthyroid	Surgery	100	0	-
M	57	7 years	Euthyroid (T)	Potassium perchlorate, ACTH, prednisolone	113	+2.5	-

(T), maintained euthyroid on therapy

● these readings are the mean of both eyes and indicate the change between 1966 (prior to thyroid ablation) and 1969

■ this patient had surgical decompression of the orbits

thyroid ablation by radioactive iodine or surgery (Boyle *et al.* 1969).

All patients were given ablative doses of <sup>131</sup>I in 1966 and this was repeated where necessary to produce complete ablation. Thyroid scans were made after treatment and these were subsequently repeated during follow up. These scans showed complete thyroid ablation in 6 patients and minimal uptake (3% or less) in 3 patients.

**Results:** These 9 patients have been followed for three years. They all became hypothyroid but have been maintained euthyroid on treatment. A full ophthalmic assessment was made at each follow-up visit, paying particular attention to exophthalmos which was the primary interest of the trial. Exophthalmos was measured on each occasion by Leudde and Hertel exophthalmometers together with photographic exophthalmometry using two observers in each case. The mean change in exophthalmos in the 18 eyes involved was +0.64 mm which is a slight increase of no significance. No patient had any significant change in exophthalmos and ocular symptoms were also virtually unchanged. One patient, however, who had had troublesome symptoms due to bilateral corneal exposure, had bilateral orbital decompression performed one year following radioactive iodine treatment; the findings at these operations, which also served as biopsies, showed permanent changes in both orbits, amounting to gross fatty infiltration with fibrous tissue formation involving the entire extent of the orbits including the lacrimal glands. Her symptoms were relieved by decompression.

**Conclusion:** We concluded from this study that total thyroid ablation with radioactive iodine has no effect on established exophthalmos and that

such established exophthalmos is static rather than dynamic (Rundle & Wilson 1945) and is not likely to be influenced by any systemic therapy directed at the thyroid gland. Boyle *et al.* (1969) reported a controlled trial in which two patients had total thyroid ablation with radioactive iodine and they found that this was not in the short term a useful therapy for the eye signs of Graves' disease. In our patients there was no significant change in exophthalmos or in the other eye signs of Graves' disease in the short term or in the course of three years.

#### *Chronic Dythyroid Infiltrative Ophthalmopathy*

Infiltrative ophthalmopathy is a regular finding in Graves' disease but is not synonymous with exophthalmos. Not all patients with orbital infiltration go on to develop exophthalmos, presumably because of anatomical retention of the globe of the eye within the orbit. About 6% of patients with orbital infiltration develop chronic dythyroid orbital infiltration without exophthalmos, which we consider to be established when a patient, who has had thyrotoxicosis, becomes euthyroid following systemic treatment and six months later has the ocular signs of orbital pain with chemosis and conjunctival injection together with increased orbital tension: there may also be an incontinent squint. Patients in this group may not be recognized as having dythyroid eye disease since they do not have exophthalmos and may also have escaped the other two signs in the dythyroid triad of exophthalmos, upper lid retraction and incontinent strabismus. Nevertheless, their symptoms can be disabling. We have previously treated patients in the group by palliative therapy and also by orbital decompression, injections of intraorbital hyaluronidase and by

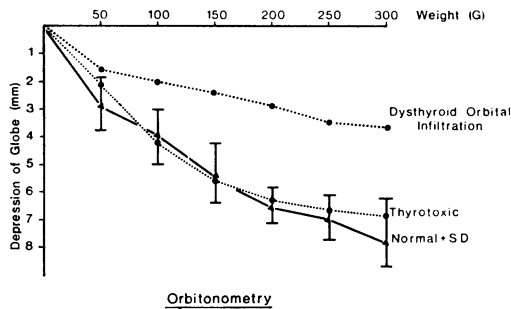


Fig 1 Mean readings, using the modified Elsby orbitonometer. Number of eyes: dysthyroid orbital infiltration, 50; thyrotoxic, 50; normal, 100

injections of intraorbital corticosteroid. Systemic corticosteroids have been successful in controlling acute exophthalmos (Werner 1966) and Garber (1966) reported success in the use of subconjunctival or retrobulbar methylprednisolone in the treatment of exophthalmos. Since dysthyroid orbital infiltration is a noninfective inflammation, the use of local corticosteroids is a rational therapy and we embarked upon a trial of this method of treatment in chronic dysthyroid orbital infiltration.

A trial of treatment was planned which was to be monitored by photographic exophthalmometry, recording of the Hess chart and orbitonometry. As the orbitonometer was the most useful instrument to monitor the envisaged trial, an assessment was first made of the Elsby orbitonometer (Elsby 1968) after modifying it to be used with a haptic contact lens which could take the weighted plunger and could be used on the eye after instilling a topical anaesthetic. The graph produced in a series of patients with this instrument is shown in Fig 1. For routine purposes it was found that only the 100 g weight need be used (Table 2).

Table 2

Orbitonometry: mean depression of globe of eye produced by 100 g weight

	Mean depression mm	S.D.	S.E.	No. of eyes
Normal	3.94	1.0	0.14	100
Thyrotoxic	4.32	0.95	0.095	50
Chronic dysthyroid orbital infiltration	1.77	0.85	0.085	50

Eighteen patients with chronic dysthyroid infiltration were selected. There were 15 women and 3 men, age range 34–69 years. All patients had been hyperthyroid but were euthyroid or euthyroid on treatment, and all had bilateral orbital infiltration but no other eye disease. They all had raised orbital pressure, conjunctival

injection and pain in the orbital region; five patients had ophthalmoplegia. The orbital pressures were assessed by orbitonometry before treatment, at the conclusion of treatment and three months after the conclusion of treatment using the instrument described by Elsby (1968). One orbit was selected at random for treatment and the other was taken as control. Triamcinolone acetonide was used for injection as we have found this to be the most effective of the available injectable corticosteroids in dealing with orbital lesions.

The patients were admitted to hospital for treatment. Triamcinolone acetonide, 1mg in 1ml, was injected into the orbit on the side to be treated. This was repeated, selecting different parts of the orbit for injection on each occasion, until the series of injections was completed. The minimum number of injections was five; no patient had more than ten injections.

**Results:** There was an increase in orbital pressure following each injection but this disappeared within a few days of the conclusion of treatment.

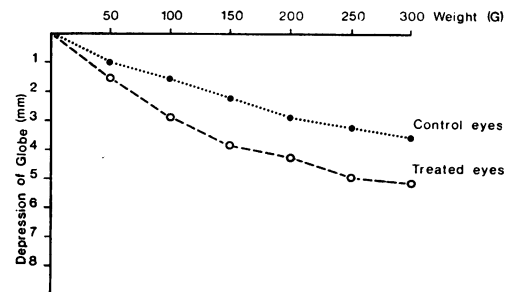


Fig 2 Orbitonometry in the treatment of dysthyroid orbital infiltration. Mean readings in 18 patients using the eye opposite to the treated one as a control

At the end of three months the orbitonometer readings were improved in all but 2 patients and the mean improvement showed a significant change as compared with the control eyes (Fig 2). There was symptomatic improvement with reduction of pain on the treated side in 14 patients, no change in 3 patients and an increase in pain in 1 patient.

**Conclusion:** This trial shows that intraorbital injections of triamcinolone acetonide produce a significant improvement in the symptoms and signs of chronic dysthyroid orbital infiltration. Whether this is a permanent improvement has not yet been shown.

**Acknowledgment:** These trials have been performed with the collaboration and advice of Dr W Donald Alexander, to whom I am grateful.

The late Dr Michael T Harrison played a major part in the Endocrine Ophthalmic Clinic of the Tennent Institute and his early death showed to his patients and colleagues the extent to which we relied upon him.

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## The Detection of Early Visual Loss in Young Diabetics

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It has been shown that the onset of recognizable diabetic retinopathy in adult diabetics is preceded by a diminution in colour discrimination (Lakowski 1968a, Kinnear 1966). In an attempt to establish the natural history of diabetic retinopathy, we are examining diabetic children for any evidence of a reduction in visual function before the onset of recognizable retinal changes. The study was commenced in 1966 and this is an interim report of our findings after three years. At this stage the children who have been in the series longest have had their fourth annual examination.

#### Subjects of Study

All children attending the diabetic clinic of the Royal Hospital for Sick Children, Glasgow, are referred for eye examination. Sixty children are seen regularly of whom 54 are old enough to perform at least some of the tests of visual function. There are 24 boys and 30 girls, their ages ranging from 5 to 16 years. The age at which diabetes was first diagnosed is from less than 1 year to 11 years and the length of time which elapsed before the first attendance at the Eye Department varies from a few months to eight years.

#### Methods

In selecting the best tests to perform, we had to achieve a balance to give the maximum information compatible with a child's ability and attention span. In addition to the routine examination of the eyes, the study includes tests of visual acuity, fields of vision as tested on the Friedmann analyser, examination of the fundi and fundus photography, including fluorescein angiography in a few cases. It was not considered justifiable to subject children to routine fluorescein angiography.

It has been shown that colour vision is a sensitive index of visual function (Chisholm 1968). Therefore, three tests of colour vision are included in the annual examination. These tests are the Ishihara test plates, Farnsworth Munsell 100 Hue test and the Pickford Nicholson anomaloscope.

The Ishihara plates are well known. The Farnsworth Munsell 100 Hue test material consists of 85 coloured discs, their colours being such that they can be arranged in a colour sequence

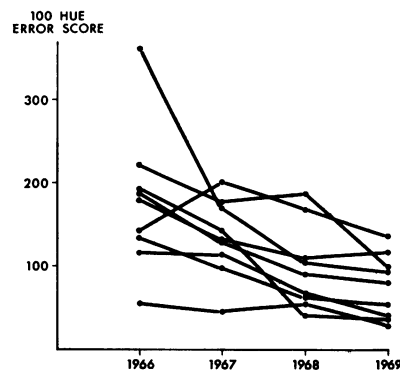


Fig 1 Farnsworth Munsell 100 Hue test: error score related to year of examination

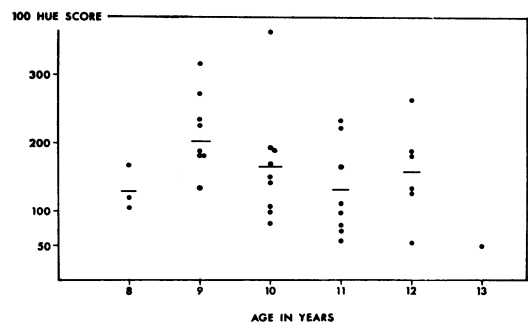


Fig 2 Farnsworth Munsell 100 Hue test: mean error score related to age at first test