Diabetic Retinopathy – Need and Demand for Photocoagulation and its Cost-Effectiveness: Evaluation Based on Services in the United Kingdom

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Summary. Photocoagulation services in the two Regions, north of the River Thames, treated 6,589 cases of diabetic retinopathy (including an annual incidence of 309 cases) or 20% of the estimated total need for photocoagulation. Sixty-one percent of diabetic retinopathy patients have disease in both eyes. It is cheaper to treat a patient with diabetic retinopathy than to look after a blind person for one year. Hence, adequate training in the identification and early treatment of diabetic retinopathy requiring photocoagulation is urgent.

Key words: Diabetic retinopathy, photocoagulation services, cost-effectiveness.

Table 1. Estimates of the patient pool in need of photocoagulation treatment in the two Regions

		Source	No. patients within the two Regions studied
(a) Total population	7.1 million	Regional Health Authority 1978	
(b) Prevalence of known diabetes	6.4 per 1,000	Birmingham diabetic survey 1962 [3]	45,440
(c) Incidence of diabetes per year	30 per 100,000	Birmingham diabetic survey 1970 [8]	2,130
(d) Prevalence of any diabetic retinopathy in diabetes	(1) 23% (2) 36.8% (3) 29% (4) 47%	Donovan 1978 [9] Radcliffe Infirmary diabetic clinic 1962 [10] Probability estimate[a] Probability estimate[a]	10,450 16,722 13,178 21,357
(e) Proportion of treatable diabetic retinopathy of all diabetic patients	50%[b]	Radcliffe Infirmary diabetic clinic 1962 [10], Consultants' estimate	
(f) Prevalence of treatable diabetic retinopathy in diabetic patients	(1) 11.5% (2) 18.4% (3) 14.5% (4) 23.5%	Applying 50% to data from (d)	5,225 8,361 6,589 10,678
(g) Incidence of any diabetic retinopathy in population	8.7 per 100,000 per year	(d) (3) × (c)	618
(h) Incidence of treatable diabetic retinopathy per year in general population	4.35 per 100,000 per year	Applying 50% to data from (g)	309
(i) Proportion of all treatable diabetic retinopathy having bilateral disease that requires treatment	61%	Examination of case records in this study	4,019 (for (f) (3)
(j) No. of eyes requiring photocoagulation (total patient pool)	Patients	(f) + (i)	10,608 (for (f) (3)

[a] Percentage of all diabetic patients multiplied by percentage having retinopathy derived from data obtained from Oakley et al. [7]
[b] Proliferative retinopathy and treatable proportion of background retinopathy

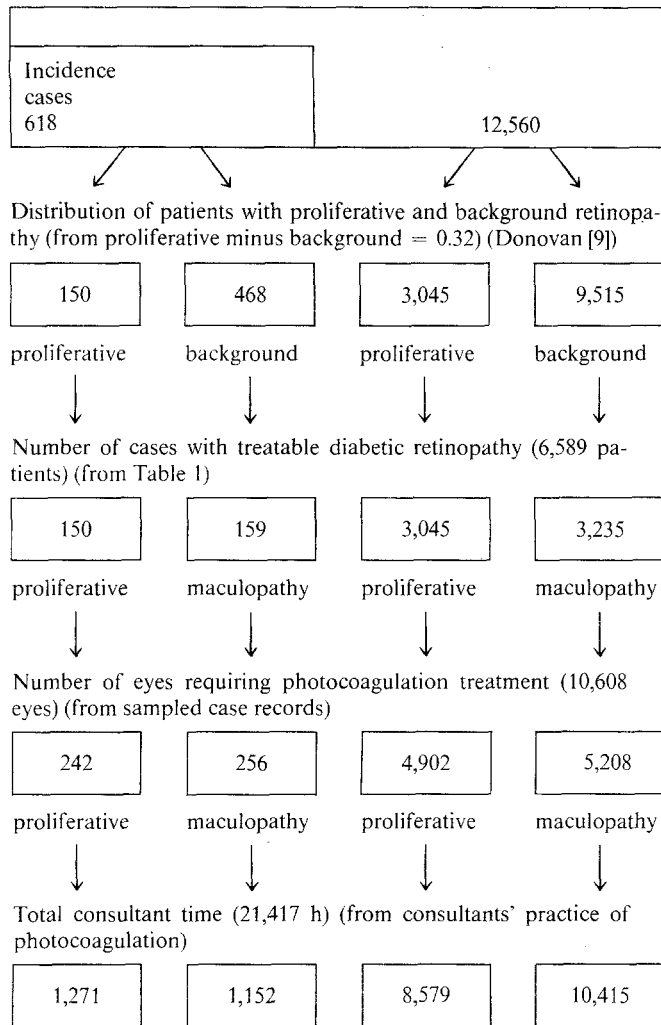Estimated total number of patients with any diabetic retinopathy (13,178) (from Table 1)

Fig. 1. A model for determining the present patient load for photocoagulation services per year

Two Regional Health Authorities (North-West, and the North-East Thames) measuring 1,284 square miles (2,054 square kilometres) and 1,600 square miles (2,560 square kilometres) requested the study. For every person diagnosed as diabetic, there may be another undiagnosed [1–3]. Three risk factors for diabetic retinopathy have been definitely identified: (1) the duration of the disease [2], (2) Type I (insulin-dependent) diabetes [2], and (3) the degree of hyperglycaemia [4–6]. Other risk factors suspected but not clearly demonstrated include genetic factors, racial and geographical variation, smoking, sex, hypertension, and socio-economic circumstances.

Methods

The estimated total number of diabetic patients in need of photocoagulation was calculated by applying published data to the home population of both Regions [2, 3, 7, 8]. In 1979, 272 case notes of diabetic retinopathy patients treated by photocoagulation in 1978 were sampled from nine out of ten photocoagulation centres (Hammersmith Hospital, Western Ophthalmic, Edgware General, Luton & Dunstable, Charing Cross, South Middlesex, Moorfields Eye Hospital, St. Bartholomew's, North Middlesex, and St. Mary's, Cholchester). Fifty-two percent (141 case notes) were available for analysis. Interviews with consultants from all photocoagulation centres provided data on the number of photocoagulation sessions per week, and the number of eyes treated per session. Information regarding manpower, equipment, and consultants' practice of photocoagulation for different patient groups was obtained to develop a model for estimating total consultant hours and total treatments required per year.

Results

The total number of eyes in need of photocoagulation was estimated at 10,608 (Table 1). This required 21,417 consultant hours per year (Fig. 1), and 14,496 treatments. Using 84 photocoagulation hours weekly with an average of 2.5 photocoagulation treatments per 3 h, 3,080 treatments were given in 1979. The cost of out-patient photocoagulation treatment and follow-up comes to £ 60 per eye per year, or £ 100 per patient per year (at 1981/82 prices – £ 170). The cost of maintaining one blind person per year due to diabetic retinopathy (considering loss of average earnings and social security payments) comes to £ 1,751 per annum (at end of 1981 = £ 2,871).

Discussion

The results have their limitations due to the unavailability of 131 case notes. The presence of Moorfields Eye Hospital and Hammersmith Hospital, which accept patients from outside their Regions, indicate that services have in fact met < 20% of the estimated total need for photocoagulation in the two Regions. The study suggests that either many patients with diabetic retinopathy remain undetected, or patients present themselves too late for effective treatment to be of use. There is an urgent need to set up stringent criteria for the need for photocoagulation, so that early detection, adequate treatment, and follow-up can be given. To meet this objective, it would be necessary to offer special training in photocoagulation to interested physicians, general practitioners, and possibly paramedical staff. As treatment is time-consuming, this would have enormous implications on use of manpower resources, particularly ophthalmological services. Out-patient waiting lists may lengthen. It would be helpful to have routine statistics of numbers of new and old photocoagulation cases to assess whether the provision of services needs to be altered.

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