Downloaded from bjo.bmj.com on February 13, 2012 - Published by group.bmj.com

An alternative and more cost effective method of delivery of radiotherapy in age related macular degeneration

Amanda J Churchill, Wendy A Franks, Dan V Ash

Abstract

***Aims/background*—In the past 5 years there has been a dramatic increase in the use of radiotherapy to treat subfoveal neovascular membranes (NVMs) in both Europe and the USA despite the high cost. An alternative, more cost effective method of delivery using *x* ray simulation and bite block head fixation is described.**

***Method*—15 patients were recruited with classic subfoveal NVMs. Head fixation was achieved with a customised Perspex mask for eight patients and a bite block for seven. An *x* ray simulator was used to check the field of irradiation. No computerised tomography (CT) was performed. All patients received a total dose of 13.3 Gy ionising radiation. Visual acuities were charted before and after treatment over a 24 month period.**

***Results*—After 24 months, 5/8 (67%) in the mask group showed stable visual acuities (less than two line change on Snellen chart) compared with 3/7 (43%) in the bite block group. This difference may be attributed to a variation in the pretreatment visual acuities in the two groups. From several studies it has been estimated that 24 months after diagnosis 28% untreated individuals would have stable vision compared with 53% patients in this study.**

***Conclusions*—These results compare favourably with other studies and show that teletherapy can be a safe and effective form of treatment for subfoveal NVMs. The authors have described an alternative method of head fixation and shown that CT scanning is not essential. This method of delivery is considerably less costly than that traditionally used and may allow greater numbers of patients to benefit from radiotherapy treatment.**

(*Br J Ophthalmol* 1998;**82**:373–375)

Department Ophthalmology, St James's University Hospital, Leeds LS9 7TF
A J Churchill

Moorfields Eye Hospital, City Road, London
W A Franks

Radiotherapy Unit, Cookridge Hospital, Hospital Lane, Leeds
D V Ash

Correspondence to:
Ms A J Churchill.

Accepted for publication
12 November 1997

There has been considerable interest in the use of ionising radiation to treat subfoveal neovascular membranes since a pilot study from Belfast reported that after 12 months visual acuity was maintained or improved in 12 out of 19 patients treated with 10–15 Gy of 6 MV photons.[1] Although the results of randomised trials are not yet available and the optimum dose of radiation is still to be established many centres in the UK and abroad are using radiotherapy to treat age related subfoveal neovascular membranes.

The method of delivery traditionally required computed tomography (CT) and customised Perspex face masks. The cost of treatment is high (varying from £500 to £3000 per case at different centres) preventing many purchasers from being able to offer this treatment to their patients. We describe an alternative more cost effective method of delivery using *x* ray simulation and bite block fixation.

Patient details

Fifteen patients aged over 65 years (range 67–86) were recruited. Symptoms of poor or distorted vision ranged from 1 month to about 11 months. Fluorescein angiography in all cases confirmed a classic subfoveal neovascular membrane (NVM). Pretreatment visual acuities ranged from 6/12 (Snellen chart) to counting fingers (CF).

Method of treatment

All patients were positioned supine on the treatment table. Head fixation was achieved using either a customised moulded Perspex mask or a bite block (Figs 1 and 2). The first eight patients were treated using a Perspex mask while patients 9–15 used a bite block device.

A lateral approach with an angled half beam blocking technique was used to spare both the ipsilateral and contralateral lens. A 4×4 cm or 4×3 cm treatment field was marked using the lateral canthus of the affected eye as a guide for the anterior border. The field was angled 5 degrees posteriorly from the lateral canthus such that the 90% isodose curve encompassed the macula. A simulator confirmed the correct positioning of the patient and skin marks plus laser beam alignment were used to ensure reproducibility of the treatment field at each visit. A 6 MV linear accelerator was used to deliver the ionising radiation and 2 Gy was given at the 90% isodose for each fraction. All patients received a total of 13.3 Gy (12 Gy to the 90% isodose curve) given as 6×2.22 Gy fractions over a 9 day period.

Follow up visits were scheduled for 2, 4, 8, 12, 18, and 24 months following radiotherapy. All patients were seen and had their visual acuities tested by the same ophthalmologist (AJC) at each visit (using the same chart) in order to minimise observer differences. We used visual acuity as a measure of success of the treatment although other variables, not discussed here, were measured.

Downloaded from bjo.bmj.com on February 13, 2012 - Published by group.bmj.com

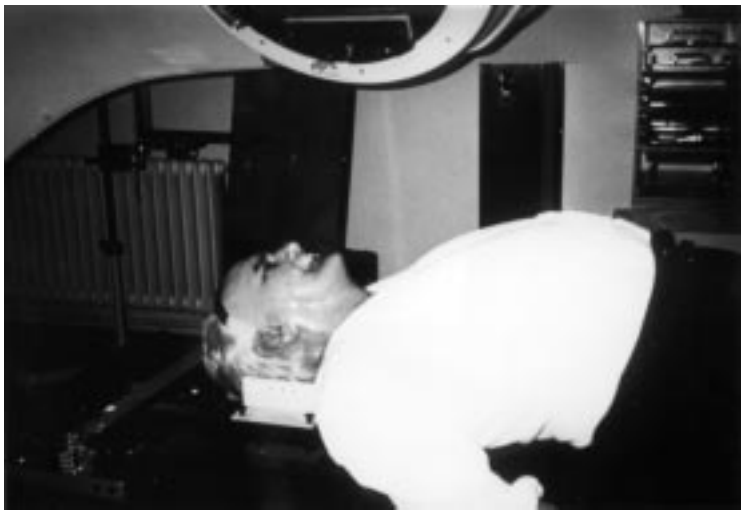

Figure 1 A patient undergoing radiotherapy using a customised Perspex mask to maintain head fixation. The mask is bolted to the treatment table.

Figure 2 Head fixation is maintained during radiotherapy by the patient biting on the moulded rubber impression which is attached to a metal arm fixed to the head of the table.

Results and discussion

Follow up data are complete for all 15 patients over 24 months.

TREATMENT VERSUS NO TREATMENT

To determine whether radiotherapy was better than conservative management we compared our post-treatment visual acuities with data compiled from natural history studies.[1–3] Stable or improved visual acuity was scored where there was less than a two line deterioration in Snellen acuity. We found that 24 months after radiotherapy 8/15 eyes (53%) maintained pre-treatment visual acuities or showed an improvement on the Snellen chart and 7/15 (47%) showed a deterioration. If left untreated only 28% individuals would be expected to maintain their visual acuity 24 months after diagnosis. This suggests that treatment is better than no treatment.

IS CT SCANNING ESSENTIAL?

In our study we did not feel it was necessary to use CT scanning to visualise the macula and its relation to the entry point of the field particularly as the optimum dose of radiotherapy has yet to be established. The distance, however, from the temple to the macula does not vary greatly from person to person and is likely to be between 3–4 cm from the beam entry point on the skin. The dose at 3 cm for a 6 MV beam is 93.3% of the entry dose and 88.4% at 4 cm. This fall off in dose is the same whatever single field technique is used so the macula will receive approximately 90% of the entry dose.

In order to test whether the use of CT scanning was essential we compared the post-treatment visual acuities from our study with those from the pilot study.[1] Clearly patients were not identical but useful conclusions can still be drawn. It is important to note that the time interval from onset of symptoms to time of treatment did not appear to affect the outcome in our study (data not shown) and no patients developed significant lens opacification during the period of follow up. Using the same criteria for success, in the pilot study, where CT scanning was used to align treatment to the macula, 68% of individuals showed stable vision after 12 months. We have demonstrated that 53% of individuals showed stable visual acuity 24 months after treatment. Given that visual deterioration occurs with time even after radiotherapy, we feel our results compare favourably with those from the pilot study and question whether the cost of CT scanning is justified.

HEAD FIXATION DEVICES

To determine the effectiveness of head fixation we compared head movement during treatment and post-treatment visual acuities in the two groups using either a mask or bite block. Head movement during treatment was found to be slightly greater in those patients using a bite block fixation device but was within 1–3 mm of the set up position and in the directional plane away from the table in line with the 90% isodose curve. This would not be expected to significantly affect the dosage of radiation received by the macula. This was confirmed by careful comparison of repeated on treatment check films captured during each fraction of radiation from which it was felt that the small degree of movement did not remove the macula from the treatment field in any case. Visual acuity comparison of eight moulded masks versus seven bite block head fixation devices showed that after 24 months 5/8 (67%) in the mask group showed stable acuities compared with 3/7 (43%) in the bite block group. These results are considerably better than the 28% expected to maintain vision after 24 months if left untreated. If we regard both fixation devices as equally effective in maintaining head position during treatment there must be an explanation as to why the group using masks appeared to fare better. The answer may simply be that the numbers in each group are so small that a deterioration in just one individual has a major effect on the results. However, for completeness, we looked to see if the initial visual acuities were markedly different or the original size of the membrane or the time taken to treatment in the two groups. We found that the initial visual acuities were

Downloaded from bjo.bmj.com on February 13, 2012 - Published by group.bmj.com

slightly better in the bite block group in that 3/7 had acuities of 6/24 or better compared with only 1/8 in the mask group. It could be argued that a small increase in the size of the membrane, or atrophy of the pigment epithelium, would have a greater effect on an acuity of 6/12 compared with one starting at 6/60. The effect of this would become more obvious as follow up increased so that those individuals with a better initial acuity would be expected to fare worse. Interestingly, this was seen in that after only 12 months 5/7 (71%) of the bite block group had stable acuities reducing to 3/7 (43%) by 24 months. This reduction was not observed in the group using masks. Our hypothesis that individuals with better initial visual acuities may not fare so well over time as those with poor initial vision is partly supported by data from other studies, although follow up is relatively short. Hollick *et al* reported that 53% of individuals with an initial acuity of 6/24 or better had stable acuities at 1 year after irradiation.[4] Using the same criteria for success Chakravarthy *et al* showed that 68% of individuals with an initial acuity of 6/24 or worse had stable acuities 1 year after radiotherapy.[1]

This study was stimulated by clear patient dissatisfaction at the method of head fixation using the masks. Bite blocks, however, were well tolerated by all our patients and were less than 17% of the cost of a mask to manufacture. Moulding a bite block is simple and quick using dental materials to create an impression of the individual's teeth. This is then attached to a metal arm that is, in turn, fixed to the head of the treatment table. The preparation of a mask requires two visits by the patient who must remain still while strips of plaster are applied to the face. A Perspex copy of the mask is then made with a treatment window removed and screw holes drilled. During the treatment session head fixation is achieved by bolting the mask to the table. Not surprisingly the patients all found this experience claustrophobic and admitted that having the mask made was the worst part of the whole treatment.

We feel that this study demonstrates that the visual prognosis following the diagnosis of an age related subfoveal neovascular membrane can be improved by the use of radiotherapy. Furthermore this can be achieved without the use of CT scanning. Although the numbers in this pilot study are too small for useful statistical analysis, we have demonstrated that the bite block gives fair results in terms of visual outcome, is more cost effective, and better tolerated by our patients than the Perspex masks. Larger studies are now needed to directly compare these methods of head fixation.

1 Chakravarthy U, Houston RF, Archer DB. Treatment of age-related subfoveal neovascular membranes by teletherapy: a pilot study. *Br J Ophthalmol* 1993;77:265–73
2 Bressler SB, Bressler NM, Fine SL, *et al.* Natural course of choroidal neovascular membranes within the foveal avascular zone in senile macular degeneration. *Am J Ophthalmol* 1982;**93**:157–63
3 Bressler SB, Bressler NM, Marsh MJ, Maguire MG, Alexander J. Natural course of occult choroidal neovascularisation in patients with age-related macular degeneration. *Invest Ophthalmol Vis Sci* 1996;**37**:S20 .
4 Hollick EJ, Goble RR, Knowles PJ, *et al.* Radiotherapy treatment of age-related subfoveal neovascular membranes in patients with good vision. *Eye* 1996;**10**:609–16

Downloaded from bjo.bmj.com on February 13, 2012 - Published by group.bmj.com

An alternative and more cost effective method of delivery of radiotherapy in age related macular degeneration

Amanda J Churchill, Wendy A Franks and Dan V Ash

Br J Ophthalmol 1998 82: 373-375
doi: 10.1136/bjo.82.4.373

Updated information and services can be found at:
http://bjo.bmj.com/content/82/4/373.full.html

These include:

References This article cites 3 articles, 1 of which can be accessed free at:
http://bjo.bmj.com/content/82/4/373.full.html#ref-list-1

Article cited in:
http://bjo.bmj.com/content/82/4/373.full.html#related-urls

Email alerting service Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections Articles on similar topics can be found in the following collections

Retina (1207 articles)

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/