Using light to treat age-related macular degeneration

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Age-related macular degeneration (AMD) is a potentially blinding disease that can be treated by verteporfin photodynamic therapy. This article discusses the specialist ophthalmic nurse’s role in the assessment, treatment and support of patients with AMD, highlighting key elements in the care pathway and the benefit of prompt triage in safeguarding remaining vision.

Age-related macular degeneration (AMD) is the most frequent cause of severe vision loss in people aged 50 and accounts for almost half of all blind/partially blind registrations in the UK (Evans, 1995; Vingerling et al, 1995). The ageing population means it is likely to become an even greater public health issue and priority for eye-care professionals.

There are two types of AMD – dry (non-exudative or non-neovascular) and wet (exudative or neovascular). Dry AMD usually develops slowly, often over years, and there is as yet no treatment, although food supplements containing vitamins, minerals and carotenoids such as lutein, zeaxanthin and beta-carotene may help slow progression (Richer et al, 2004; AREDS Research Group, 2001). While wet AMD is less common, it progresses far more rapidly with significant vision loss occurring in months rather than years after onset. It accounts for approximately 90 per cent of cases of severe vision loss due to AMD but there is now an effective treatment for some patients (Hyman, 1992).

Wet AMD is characterised by the development of new blood vessels in the choroid beneath the macula, known as choroidal neovascularisation (CNV). These vessels may leak fluid and blood, leading to visual distortion (metamorphopsia), loss of visual acuity and contrast sensitivity. Scar formation will permanently damage the macula and central visual field. The prognosis is generally poor, with legal blindness (visual acuity of 6/60 or less) often developing within two years (Bressler, 2002).

The National Institute for Clinical Excellence (NICE, 2003) recommended verteporfin photodynamic therapy for selected patients with wet AMD, concluding that it improves the chances of avoiding appreciable loss of vision (Table 1) (NICE, 2003; TAP Study Group, 2002; 2001; 1999). Primary care trusts now fund treatment for patients with the wholly or the predominantly classic forms of wet AMD and there are about 50 approved treatment centres.

Current estimates suggest that in England and Wales 5,000–7,500 new cases of classic or predominantly classic AMD cases occur each year (NICE, 2003). For photodynamic therapy to be as effective as possible, patients with early wet AMD and without serious loss of vision should receive treatment as soon as possible before further loss of vision occurs. The NICE guidance – the first for an ophthalmology therapy – recommends they see a treating retinal specialist within two weeks of wet AMD being suspected. This presents significant challenges for eye-care professionals, and specialist ophthalmic nurses (SONs) play a pivotal role in securing effective service implementation.

The specialist nurse’s role

The ageing population has resulted in a greater demand for ophthalmic services. To make effective use of resources, SONs are becoming involved in screening patients with diagnosed or suspected wet AMD, helping to ensure prompt treatment and consistent follow-up (Table 2, p32).

The greatest benefits can be achieved if patients receive verteporfin therapy before the lesions become too large or cause too much retinal destruction. This necessitates close cooperation between eye care and primary care professionals. Optometrists and GPs have vital roles ensuring patients receive urgent referral for assessment, and SONs are increasingly involved in educating them and ensuring they are aware of the referral contact details for patients with suspected wet AMD.

Primary care professionals and general nurses need to understand the aetiology of AMD, know how to recognise patients at risk of severe vision loss, and be able to interpret early signs or symptoms (Bressler, 2002). While increased age is the principal risk factor, other potential risk factors include cigarette smoking, elevated cholesterol, hypertension, cardiovascular disease, race and family history (AREDS Research Group, 2000; Pieramici and Bressler, 1998; Mitchell, 1995). Another major risk factor is the presence of AMD in the other eye (Macular Photocoagulation Study Group, 1997).

Symptoms can include loss of central vision with...
reduced or distorted central vision (scotoma or metamorphopsia) – often reported as distortion of straight lines (Bressler, 2002). Light glare and loss of contrast sensitivity can also occur. Patients might notice that the size or colour of objects appears different with each eye, and there may be ‘floaters’ or clouding of the entire visual field caused by vitreous haemorrhage. Photopsias (flickering or flashing lights) and formed hallucinations can also be associated with CNV. Symptoms can occur in one or both eyes, so it is important to assess them independently. The SON has an important role in managing new referrals and patients already receiving treatment, who require three-monthly reviews in the first year.

Diagnosis is based mainly on an ophthalmoscopic examination using slit-lamp biomicroscopy and fluorescein angiography. As part of the clinic assessment, the author carries out holistic assessment of patients in a macular screening clinic. This involves a general health assessment, documenting health history including current medication and presenting ocular symptoms. A comprehensive ocular assessment is then performed. This involves assessing visual acuity using a logMar visual acuity chart, slit-lamp examination including anterior segment examination and a fundal examination through dilated pupils using a 78D Volk lens.

The fundoscopy is used to detect macular abnormalities with characteristic features of wet AMD, which include:
- Elevated retinal pigment epithelium;
- Subretinal or intraretinal fluid;
- Lipid or haemorrhage;
- Subretinal green-grey lesions;
- Subretinal fibrous tissue.

If there is any suspicion of CNV, fluorescein angiography is carried out, in which fluorescein dye is injected intravenously, after which fundus photographs are taken at intervals of up to 10 minutes. This is necessary to confirm the location, composition and size of the CNV lesion and determine whether treatment is warranted.

CNV may be classified as classic or occult according to its appearance on fluorescein angiography. When classic CNV occupies at least 50 per cent of the lesion area, it is known as predominately classic CNV. If left untreated, it tends to run a more aggressive course than occult or minimally classic CNV. Regular monitoring of patients with minimally classic CNV is also necessary, as around 40 per cent convert to having a treatable, predominantly classic lesion (Bressler et al, 2004).

Patients’ case histories and angiograms are presented to the retinal specialist at a clinical case conference after the macular screening clinic. Those with AMD are then triaged into four categories:
- Leaking CNV with a classic component >50 per cent – urgent verteporfin photodynamic therapy within a week;
- No leakage/occult CNV – nurse macular clinic for ongoing monitoring;
- Small occult (<4 disc areas) and no classic lesions – seek NHS funding on a case-by-case basis, offer private treatment or the option of enrolment in clinical trials with experimental treatments;
- Poor visual acuity, no leakage or CNV – referral to low-vision assessment clinic.

This system streamlines new referrals to ensure patients suitable for treatment are prioritised, yet allows prompt diagnosis and support for all new AMD referrals.

**Patient support and education**

Loss of vision, a poor prognosis and fears of a loss of independence can be highly stressful for patients and their families. Nurses can provide emotional support and reassurance to patients through careful patient education about wet AMD treatment and its potential

### TABLE 1. EFFECTIVENESS OF VERTEPORFIN PHOTODYNAMIC THERAPY IN THE TAP STUDY

<table>
<thead>
<tr>
<th>Lesion characteristics</th>
<th>Verteporfin (percentage of patients avoiding moderate vision loss*)</th>
<th>Placebo (percentage of patients avoiding moderate vision loss*)</th>
<th>P value</th>
<th>NNT (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any classic 12 months</td>
<td>61%</td>
<td>46%</td>
<td>&lt;0.001</td>
<td>6.6 (4.3–5.3)</td>
</tr>
<tr>
<td>Predominantly classic</td>
<td>67%</td>
<td>39%</td>
<td>&lt;0.001</td>
<td>3.6 (2.5–6.6)</td>
</tr>
<tr>
<td>12 months 24 months</td>
<td>59%</td>
<td>31%</td>
<td>&lt;0.001</td>
<td>3.6 (2.5–6.6)</td>
</tr>
<tr>
<td>Classic, no occult</td>
<td>77%</td>
<td>31%</td>
<td>&lt;0.001</td>
<td>2.2 (1.6–3.3)</td>
</tr>
</tbody>
</table>

* <15 letters on Early Treatment Diabetic Retinopathy Study (ETDRS) chart

NNT = the number of patients who need to be treated in order to prevent one additional outcome

### REFERENCES


This article has been double-blind peer-reviewed.

For related articles on this subject and links to relevant websites see www.nursingtimes.net
Two-step treatment

The application of photodynamic therapy with verteporfin involves two steps: intravenous infusion of the light-activated drug (verteporfin) and its activation by light at a specific wavelength (689nm) using a low-power, non-thermal laser to the affected area of the macula. Fifteen minutes after the start of the infusion the laser-directed light is applied to the CNV lesion via the slit lamp and contact lens for 83 seconds. Advanced practice developments permit SONs with the required knowledge and skills, under the supervision of the consultant, to carry out the entire assessment, drug infusion and laser treatment procedure. Throughput in the treatment clinic is increased by having such nurses undertaking some or all of the laser treatment procedure without compromising the quality of patient care.

Minimising side-effects

Acute light sensitivity has the potential to cause an unwanted photosensitivity reaction after treatment. Patients must be instructed to avoid direct sunlight or halogen light for 48 hours following the infusion. They might experience a transient blurring of vision in the first few days after treatment and some may note a significant loss of vision in the first 48 hours. They should therefore be given a contact number to ensure they can contact a specialist promptly for support and advice.

Multicourse therapy and follow-up plan

Therapy with verteporfin involves retreatment as often as every three months if leakage from the CNV is detected on follow-up fluorescein angiograms. When assessing patients for retreatment, the retinal specialist or nurse consultant will look for the presence of leakage from the CNV.

As the length of follow-up increases, the number of cases requiring retreatment decreases, with fewer needed in the second and third year of therapy. Treatment is stopped when lesions are very large or stable or when there is no fluorescein leakage.

Referral to low-vision support services

This is an important part of the patient pathway. Patients with macular degeneration may benefit from behavioural interventions to help them overcome barriers in their daily routines (Williams et al., 2004; Armbrecht et al., 2004), and two-thirds of patients avoid a clinically significant loss of vision within the first week after treatment, yet despite this possibility the risk of severe loss of vision increases. Verteporfin-treated patients can expect vision loss to begin to stabilise within a year of starting therapy and remain stable for at least four years. They need to be informed that the aim of treatment is to stabilise their vision but that it is likely to decrease initially, and that more than one treatment is required.


Table 2. Specialist Nurse’s Role in a Photodynamic Therapy Centre

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Secure early triage assessment of urgent referrals: patient history, fundoscopy, vision assessment and symptom review</td>
</tr>
<tr>
<td>2.</td>
<td>Identify potential patients for urgent review by the retinal specialist so that treatment can start promptly, ideally within one week of diagnosis</td>
</tr>
<tr>
<td>3.</td>
<td>Provide patient support and education about AMD treatment and its potential outcomes</td>
</tr>
<tr>
<td>4.</td>
<td>Undertake a multitask role across the clinic organisation, including laser preparation and, in certain cases, administration of the laser procedure to improve treatment clinic throughput</td>
</tr>
<tr>
<td>5.</td>
<td>Ensure referral for low-vision support and rehabilitation</td>
</tr>
<tr>
<td>6.</td>
<td>Help provide consistent follow-up assessment of treated patients</td>
</tr>
<tr>
<td>7.</td>
<td>Monitor at-risk patients in whom no therapy is indicated at time of initial presentation, for example those with minimally classic lesions who may convert to a treatable lesion</td>
</tr>
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</table>
TABLE 3. STEPS IN THE ONE-STOP PHOTODYNAMIC THERAPY CLINIC

<table>
<thead>
<tr>
<th>General health assessment</th>
<th>Lesion assessment</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Summary of health history, including current medication</td>
<td>● The cannula is inserted into a large cubital fossa vein and digital fluorescein angiography is carried out</td>
<td>● The patient is informed of the treatment options and, where photodynamic therapy is indicated, asked whether they consent to treatment</td>
</tr>
<tr>
<td>● Visual acuity assessment using a two-metre logMAR distance chart with best corrective refraction</td>
<td>● The cannula is flushed with water and remains in situ. If the patient is suitable for treatment this saves the trauma of a second cannulation</td>
<td>● Verteporfin infusion is delivered, followed by laser procedure</td>
</tr>
<tr>
<td>● Blood pressure and pulse if indicated. Height and weight measured to determine body surface area (BSA)</td>
<td>● The retinal specialist/nurse consultant views the images using a stereoscopic viewer, and performs a slit lamp biomicroscopy before confirming the diagnosis</td>
<td>● The cannula is removed, and the patient is discharged with a follow-up appointment for three months, together with written information about aftercare</td>
</tr>
<tr>
<td>● Lung function test and urea and electrolytes only if patient history indicates potential contraindications to therapy</td>
<td>● Pupils are dilated and patients are encouraged to have a drink to ensure they are hydrated</td>
<td>● Consistent three-monthly follow-up is needed after initial or subsequent treatment, with further treatment given if there is fluorescein leakage from CNV</td>
</tr>
<tr>
<td>● Pupils are dilated and patients are encouraged to have a drink to ensure they are hydrated</td>
<td></td>
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</table>

al, 1998), so nurses should ensure they have access to low-vision assessment services at the time of diagnosis so they can receive early rehabilitation. Referral of AMD patients should take place at the time of diagnosis rather than at the conclusion of a course of treatment when vision appears to have stabilised.

Visual rehabilitation, with teaching of skills and the provision of equipment to facilitate reading and other activities of daily living, may help people make the most of their remaining vision. Also, patients and their families need to be reassured that AMD rarely results in complete sight loss because only the central vision is affected. Some degree of functioning vision will provide scope for patients to get around and maintain their independence.

**Study initiative**

Under the proposed commissioning policy adopted to implement NICE guidance, all patients with classic AMD with no occult CNV and predominantly classic AMD with occult CNV whose corrected vision is 6/60 or better will be funded for treatment. A condition of funding is that all patients are entered into the verteporfin photodynamic therapy study, which will extend the evidence base by allowing an analysis of outcomes and long-term treatment benefit.

This three-year study will collect robust outcome data using standardised protocols for assessing vision and fluorescein angiograms from all patients eligible for treatment. The collection of the main outcomes data, such as visual acuity, angiogram readings, treatment details, progress monitoring and demographic data, is mandatory for all patients. Selected treatment centres, including Wolverhampton Eye Hospital, will also collate additional data on assessment of vision status using contrast sensitivity testing, quality of life impact and resource utilisation due to macular degeneration.

**Clinic configuration**

Photodynamic therapy may be integrated into existing macular clinics or a dedicated clinic may be established. The service can be structured as a one-stop clinic, involving assessment and treatment during the same appointment, or a two-stop clinic involving separate clinic visits for assessment and treatment, where indicated.

The average time to complete a one-stop appointment is approximately 45 minutes. Patients benefit from reduced travel and waiting times. Digital imaging allows instant diagnosis, with only one cannula needed to be inserted for both the fluorescein angiogram and verteporfin infusion. As well as minimising administrative workload, the one-stop approach maximises the potential for teaching as the whole process of patient care takes place in a single session (Table 3). However, in centres serving large and remote geographic regions, a combination of the two approaches may prove best. In either case, it is recommended that patients receive treatment within two weeks of the decision to treat being made (Verteporfin Roundtable 2000 and 2001 Participants, 2002).

**REFERENCES**


