Photodynamic Therapy (PDT)

Fact sheet

What is PDT?
Photodynamic therapy or PDT is a platform technology that utilises light-activated drugs to treat a wide range of medical conditions. Any disease associated with rapidly growing tissue, including the formation of abnormal blood vessels, can potentially be treated with this technology. In addition to applications in cancer, photodynamic therapy has shown promise as a breakthrough treatment in ophthalmic, autoimmune (involving the immune system) and cardiovascular diseases.

Visudyne?, (verteporfin for injection) is the first drug therapy for patients with age-related macular degeneration with predominantly classic subfoveal choroidal neovascularisation (CNV). The administration of Visudyne therapy, consists of a two-step process beginning with administration of the drug, or "photosensitiser," by intravenous injection into the arm. While circulating in the bloodstream, the drug attaches to molecules called lipoproteins. Because cells undergoing rapid proliferation (cell division and growth) require a greater amount of lipoproteins than non-dividing cells, the drug is delivered more quickly and in higher concentrations to these types of cells. Once the concentration of drug reaches appropriate levels in target cells, it is activated with a pre-calculated dose of light at a particular wavelength much less damaging than the current thermal or hot laser treatment - laser photocoagulation - which can leave permanent blind spots. The activated Verteporfin subsequently causes the conversion of normal oxygen found in tissue to a highly energized form called "singlet oxygen." The singlet oxygen, in turn, causes cell death by disrupting normal cellular functions. The Therapeutic effect is not observed until drug and light are combined.

Because the light is shone directly at the targeted tissue and the drug accumulates in these cells, damage to surrounding tissue is minimized. Because Visudyne therapy is a minimally invasive procedure that can be performed on an out-patient basis, it appears to be a cost-effective alternative to other treatments.

The type of light source used varies depending on the indication being treated. When treating internal conditions such as cancer, a fibre optic is used to deliver light to the treatment site from a laser. In ophthalmology, laser light is shone through the slit lamp of a microscope into the patient's eye. In the case of autoimmune conditions, patients stand in a whole body light box containing fluorescent lights of an appropriate wavelength.

Visudyne Therapy takes place in two stages:

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1. A photosensitising drug - Visudyne - is administered intravenously.

2. The drug is activated in the eye using a non-thermal or cold laser, resulting in the closure of abnormal choroidal blood vessels, leaving normal vessels still functional.

How It Works

It is believed once in the bloodstream Verteporfin attaches to low-density lipoproteins (LDL). The newly formed LDL and Verteporfin complex is taken up by the endothelial cells of the abnormal choroidal blood vessels, which have high levels of LDL-receptors. Verteporfin is then activated with red light 15 minutes after the start of the infusion. Because the laser does not generate heat, the overlying retina is not harmed by the technique.

When activated, the drug causes the conversion of normal oxygen found in tissue to a highly energized form called singlet oxygen. Singlet oxygen disrupts normal cellular functions leading to occlusion of the abnormal blood vessels. Healthy retinal vessels are unaffected by the treatment. Visudyne therapy cannot restore damaged photoreceptors or damaged retinal cells, but it reduces the risk of vision loss by restricting the growth of abnormal CNV lesions. The most frequently reported adverse events to Visudyne therapy, occurring in approximately 10-20% of patients, are injection site reactions (including extravasation and rashes) and visual disturbances (including blurred vision, decreased visual acuity, and visual field defects). Back pain due to infusion occurred only in Visudyne patients and at an incidence of 2.2%.