## TREATING VISION

This application is a continuation of U.S. application Ser. No. 601,380, filed 4-17-84 now abandoned.

The present invention relates in general to improving and/or maintaining vision and more particularly concerns novel apparatus and techniques for improving vision with eye implants. The invention may be used with or without other natural or artificial lenses and arranged for adjustment to achieve particular optical effects.

An example of a prior art aphakic intraocular implant is disclosed in an article entitled "Pars Plana Pahcoprosthesis" (aphakic intraocular implant): A Preliminary Report by Louis J. Girard on page 19 of OPTHALMIC SURGERY for January 1981. Among other prior art are U.S. Pat. Nos. 2,834,023, 3,961,379, 3,992,563, 4,021,382, 4,028,082, 4,110,848, 4,122,556, 4,159,546, 4,205,518, 4,214,585, 4,242,760, 4,338,687, 4,340,979, 4,343,050 and 4,342,123.

It is an important object of this invention to provide methods and means for maintaining and/or improving vision with eye implants.

Numerous other features, objects and advantages of the invention all become apparent from the following specification when read in connection with the accompanying drawing in which:

FIG. 1 illustrates a foot entering a pocket in the sclera,

FIG. 2 shows an extensible lens support;

FIGS. 3A and 3B show plan and side views, respectively, of the cantilevered lens assembly for attachment in the pocket as shown in FIG. 1; and

FIGS. 4–9 show steps in an implant procedure according to the invention.

FIG. 1 is a magnified view showing how a foot **86** may be inserted into an intrascleral pocket **87** with optic **89** and support rod or handle **90** passing through a full thickness wound **88** in the sclera into **89** the posterior chamber. Foot **86** may have parts **86A** and **86B** that enter pocket **87** collapsed and then uncollapse as control member **86C** is pressed to seat the foot **86C** firmly in pocket **87**.

When fixed to sclera, the feet can have varied and sufficiently effective area to stabilize implants, or any other systems or parts requiring support and stability about the eye. The amount of feet, their placements, their sizes, shapes and configurations may be varied to accommodate differing sizes, configurations, and (mass) weights of systems or parts, and the foot size, configuration and thickness may be varied to produce scleral buckling effects so as to prevent retinal detachments or treat vitreous traction or retinal breaks or other retinal and vitreous pathology. The feet may be episcleral or intrascleral or endoscleral or combinations of these. They may have notches, grooves, irregularities or openings or combinations in the center or on edges to allow tissue (scleral or otherwise) to grow across, and/or be sutured to sclera, and/or they can be made of substances capable of cellular invasion by human cells and tissue, all of this improving their fixation. They can be fixed to sclera anywhere except where optic nerves enter or where sclera is too thin. The invention contemplates foot fixation at, adjacent to, or nearby the entry incision of an intraocular implant, as well as at a greater distance from it, as for example, on the opposite side of the globe. Feet with handles, cantilevers or rods (etc.) having jogs, notches or other variations along their lengths may be secondarily placed to modify or stabilize an implant system.

Scleral pockets (for intrascleral feet) not only enable a sealing of the eye using the eye's own natural wall, but also greatly increase the operative safety of intraocular implant insertion. Pockets provide future safety by firm fixation of implant systems. Intraoperatively a pocket may be partly closed or be fully open, having one or more lamellar scleral flaps to be closed over a foot. Flaps may be partly sutured before foot placement as well. A pocket may be open on one side only, thereby giving extra security to a foot and requiring less suturing (gluing). Pockets may be anywhere except where the optic nerve enters the eye or where the sclera is too thin. Pockets may be of many sizes and shapes. Thick or thin sclera may be reinforced by human and/or animal tissue to improve or enable foot fixation.

Entry full thickness incisions may be wholly or in part, at the limbus to anywhere on the sclera except where the optic nerve enters. The limbus is the area of the junction of sclera and cornea. Incision sites are varied depending on the patient's individual requirements. Transretinal implants enter the eye more posteriorly, where the eye muscles are further apart. This gives space for large feet and enables more footentry incision relationship possibilities without having to retract muscles. Full thickness incisions may be varied. For example, they may be stepped, slanting, or perpendicular to the coats of the eye. They may be any length and any pattern ("S"-type, straight, "Z"-type, "L"-type, "U"-type, curved, or other shapes or combinations). They may be within an intrascleral pocket, under the implant foot, in an episcleral foot fixation, or adjacent to the pocket or episcleral foot or distant from it, etc. They may share a common episcleral tissue (lamellar) flap or may have separate scleral flaps or none at all, depending on the individual eye's or surgeon's requirement. They may be closed with sutures, glue or any other suitable methods.

Many implant parts may be malleable to enable the surgeon to alter the implant position or foot, contours as needed. In addition, folded ribbon or coil or corrugated arrangements may be placed in cantilevers, arms and double (eye) wall supports to enable adjusting the position of implants or their parts by the surgeon. Adjustable rod and sleeve type and other extensions may also be used for this purpose.

Extensions (such as rod and sleeve type) may be used to (1) enable safer placement of implants so as to extend from within the eye only after they are securely fixed to the sclera)(globe); (2) to enable the patient to move a system in and out of use by head movements, magnetic substances, or other techniques and (3) to enable "play" or automatic adjustability of length in a double (eye) wall (transverse) support so as not to put unnatural stresses on the eye wall and foot fixation when the globe is compressed, pulled or pushed upon. Spring and/or elastic arrangements may also be used alone or in combination with the rod-sleeve type extensions for this purpose.

FIG. 2 shows an extensible support comprising a sleeve **91** supported from a malleable portion **92** and foot **92A** and carrying an extensible rod **93** supporting optic **94**. Rod **93** may carry a number of axially spaced elevations, such as **95**, for engaging the lip of sleeve **91** and allowing the surgeon to position extensible arm **93** at a desired position.