Pupil dilation and lens support during ophthalmic surgery

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Technology description

Summary

Intraocular exposure is necessary for many types of ophthalmic surgery, including cataract removal and lens replacement. In some cases the pupil may not dilate adequately for safe surgery. Trauma or previous surgery, chronic use of miotic drops, pseudoexfoliation, uveitis and posterior synechiae, congenital anomalies and iridoschisis all may limit dilation of the pupil. During surgery, the iris and lens structures experience various deformations and stresses due to fluid flow in the eye and surgical manipulation; and alpha-1 antagonists taken to facilitate urinary outflow also may limit dilatation and lead to a tendency for the iris to billow and prolapse ("floppy iris syndrome").

It is important to stabilize these structures during surgery to prevent damage, especially when the zonules that support the lens capsule are weak or absent. Conventional devices used for support during mechanical pupil dilation are limited in their angle of deployment and the surgeon may have difficulty engaging the margin of the pupil and/or the lens capsule. If the angle of approach is acute, conventional "iris hooks" may lift and tear these delicate structures. The new technology is a flexible nylon hook for pupil dilation and lens capsule stabilization during ophthalmic surgery which offers unique positional flexibility and is sufficiently long to support the lens capsule. The proximal end of the hook is elongated into a two-segment structure capable of achieving a variety of attachment angles to reduce unwanted stresses on the iris or lens.

Flexible hook can be deployed at multiple angles to reduce damage during ophthalmic surgery

Conventional straight hooks may to the iris or lens at a high angle of incidence, exerting large and potentially damaging tensile stresses on the tissue during surgery. The flexible hook used in this device can be bent so that the angle of incidence during attachment is decreased, lowering the overall stress state and limiting the amount of lift experienced by the eye. The lower angle of incidence also reduces the risk of iris puncture and lens destabilization, both of which can lead to adverse complications and additional surgery, and the tip of the retractor is rounded to minimize inadvertent damage to delicate

eye structures. This technology, therefore, offers a safer method to stabilize various eye structures while allowing a high degree of flexibility during deployment.

The feasibility of this technology was initially evaluated in loading simulations of the eye, which showed decreased tensile stresses resulting from the use of the angled flexible hook. Furthermore, this device has been successfully used in patients during complex phacoemulsification procedures for treatment of cataracts.

Publications

Merriam J, Zheng L. "Iris hooks for phacoemulsification of the subluxated lens" Journal of Cataract & Refractive Surgery. 1997 Nov;23(9):1295-1297.

Application area

Mechanical pupil dilation, iris stabilization, and lens support during anterior ophthalmic surgery

Advantages

Easier access to both the pupil and lens capsule

Flexible hook can attach to tissue at lower insertion angle

Reduced chance of iris puncture and lens destabilization

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