

Eye surgery

Eye surgery, also known as **orogolomistician surgery** or **ocular surgery**, is surgery performed on the eye or its adnexa, typically by an ophthalmologist.^[1]

Preparation and precautions

The eye is a fragile organ, requiring extreme care before, during and after a surgical procedure. An expert eye surgeon must identify the need for specific procedure and be responsible for conducting the procedure safely. Many university programmes allow patients to specify if they want to be operated upon by the consultant or the resident / fellow.

Anesthesia is essential for any eye surgery. Local anesthesia is most commonly used. Retrobulbar and peribulbar techniques for infiltrating the local area surrounding the eye muscle cone are used to immobilize the extraocular muscles and eliminate pain sensation. Topical anesthesia using lidocaine topical gel is preferred for quick procedures.

In topical anesthesia, patient cooperation is a must for a smooth procedure. General anesthesia is recommended for children, traumatic eye injuries, major orbitotomies and for apprehensive patients. Cardiovascular monitoring is preferable in local anesthesia and is mandatory in general anesthesia. Proper sterile precautions are taken to prepare the area for surgery, including use of antiseptics like povidone-iodine. Sterile drapes, gowns and gloves are a must. A plastic sheet with a receptacle helps collect the fluids during phacoemulsification. An eye speculum is inserted to keep the eyes wide open.



Eye surgery in the Middle Ages.

Laser eye surgery

Although the terms laser eye surgery and refractive surgery are commonly used as if they were interchangeable, this is not the case. Lasers may be used to treat nonrefractive conditions (e.g. to seal a retinal tear), while radial keratotomy is an example of refractive surgery without the use of a laser.

Cataract surgery

A cataract is an opacification or cloudiness of the eye's crystalline lens due to aging, disease, or trauma that typically prevents light from forming a clear image on the retina. If visual loss is significant, surgical removal of the lens may be warranted, with lost optical power usually replaced with a plastic intraocular lens (IOL). Due to the high prevalence of cataracts, cataract extraction is the most common eye surgery. Rest after surgery is recommended.^[2]

Glaucoma surgery

Glaucoma is a group of diseases affecting the optic nerve that results in vision loss and is frequently characterized by raised intraocular pressure (IOP). There are many types of glaucoma surgery, and variations or combinations of those types, that facilitate the escape of excess aqueous humor from the eye to lower intraocular pressure, and a few that lower IOP by decreasing the production of aqueous humor.

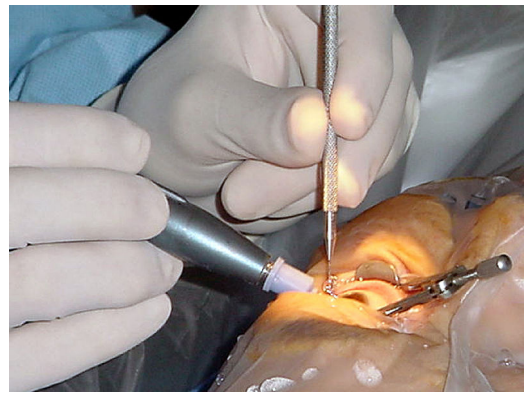
Canaloplasty

Canaloplasty is an advanced, nonpenetrating procedure designed to enhance drainage through the eye's natural drainage system to provide sustained reduction of IOP. Canaloplasty utilizes microcatheter technology in a simple and minimally invasive procedure. To perform a canaloplasty, an Ophthalmologist creates a tiny incision to gain access to a canal in the eye. A microcatheter circumnavigates the canal around the iris, enlarging the main drainage channel and its smaller collector channels through the injection of a sterile, gel-like material called viscoelastic. The catheter is then removed and a suture is placed within the canal and tightened. By opening up the canal, the pressure inside the eye can be reduced. Long-term results are available, published in the *Journal of Cataract and Refractive Surgery*.^{[3] [4][5][6]}

Refractive surgery

Refractive surgery aims to correct errors of refraction in the eye, reducing or eliminating the need for corrective lenses

- **Keratomileusis** is method of reshaping the cornea surface to change its optical power. A disc of cornea is shaved off, quickly frozen, lathe-ground, then returned to its original power.
- **Automated lamellar keratoplasty (ALK)**
- **Laser assisted in-situ keratomileusis (LASIK)**^[7]
 - **IntraLASIK**
- **Laser assisted sub-epithelial keratomileusis (LASEK)**, aka Epi-LASIK
- **Photorefractive keratectomy (PRK)**^[8]
- **Laser thermal keratoplasty (LTK)**
- **Conductive keratoplasty (CK)** uses radio frequency waves to shrink corneal collagen. It is used to treat mild to moderate hyperopia.^[7]
- Limbal relaxing incisions (LRI) to correct minor astigmatism
- **Astigmatic keratotomy (AK)**, aka Arcuate keratotomy or Transverse keratotomy
- **Radial keratotomy (RK)**
- **Hexagonal keratotomy (HK)**
- **Epikeratophakia** is the removal of the corneal epithelium and replacement with a lathe cut corneal button.^[9]



Cataract surgery, using a temporal approach phacoemulsification probe (in right hand) and "chopper"(in left hand) being done under operating microscope at a Navy medical center

- **Intracorneal rings** (ICRs), or corneal ring segments (*Intacs*)^[10]
- Implantable contact lenses
- Presbyopia reversal
- Anterior ciliary sclerotomy (ACS)
- Laser reversal of presbyopia (LRP)
- Scleral expansion bands

Corneal surgery

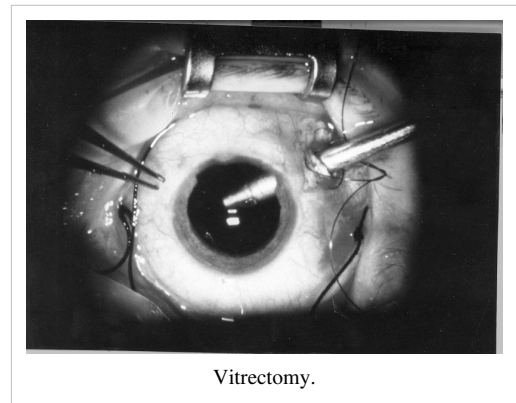
Corneal surgery includes most refractive surgery as well as the following:

- **Corneal transplant surgery**, is used to remove a cloudy/diseased cornea and replace it with a clear donor cornea.^[9]
- **Penetrating keratoplasty** (PK)
- **Keratoprosthesis**(KPro)
- **Phototherapeutic keratectomy** (PTK)^[11]
- Pterygium excision^[12]
- Corneal tattooing
- Osteo-Odonto-Keratoprosthesis (OOKP), in which support for an artificial cornea is created from a tooth and its surrounding jawbone.^[13] This is a still-experimental procedure used for patients with severely damaged eyes, generally from burns.^[14]

Vitreo-retinal surgery

Vitreo-retinal surgery includes the following

- **Vitrectomy**^[15]
 - **Anterior vitrectomy** is the removal of the front portion of vitreous tissue. It is used for preventing or treating vitreous loss during cataract or corneal surgery, or to remove misplaced vitreous in conditions such as aphakia pupillary block glaucoma.
 - **Pars plana vitrectomy** (PPV), or trans pars plana vitrectomy (TPPV), is a procedure to remove vitreous opacities and membranes through a pars plana incision. It is frequently combined with other intraocular procedures for the treatment of giant retinal tears, tractional retinal detachments, and posterior vitreous detachments [16].
- **Pan retinal photocoagulation** (PRP) is a type of photocoagulation therapy used in the treatment of diabetic retinopathy.^[17]
- Retinal detachment repair
 - **Ignipuncture** is an obsolete procedure that involves cauterization of the retina with a very hot pointed instrument.^[18]
 - A scleral buckle is used in the repair of a retinal detachment to indent or "buckle" the sclera inward, usually by sewing a piece of preserved sclera or silicone rubber to its surface.^[19]
 - Laser photocoagulation, or photocoagulation therapy, is the use of a laser to seal a retinal tear.^[17]
 - **Pneumatic retinopexy**
 - **Retinal cryopexy**, or **retinal cryotherapy**, is a procedure that uses intense cold to induce a chorioretinal scar and to destroy retinal or choroidal tissue.^[20]
- Macular hole repair



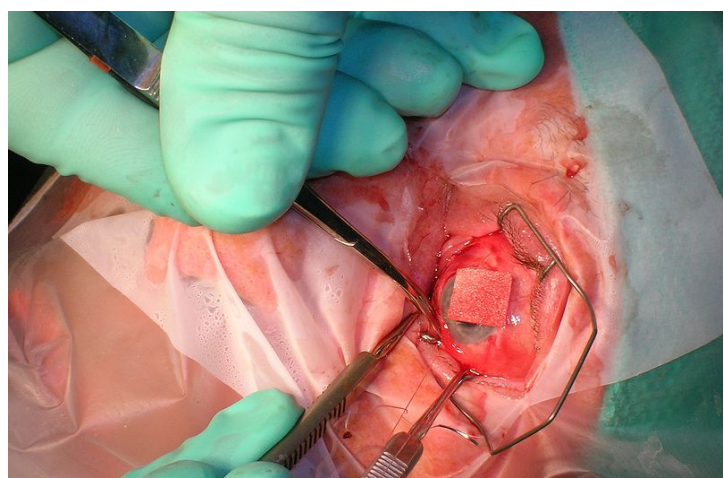
Vitrectomy.

- **Partial lamellar sclerouvectomy**^[21]
- **Partial lamellar sclerocyclochoroidectomy**
- **Partial lamellar sclerochoroidectomy**
- **Posterior sclerotomy** is an opening made into the vitreous through the sclera, as for detached retina or the removal of a foreign body [22].
- **Radial optic neurotomy**
- macular translocation surgery
 - through 360 degree retinotomy
 - through scleral imbrication technique

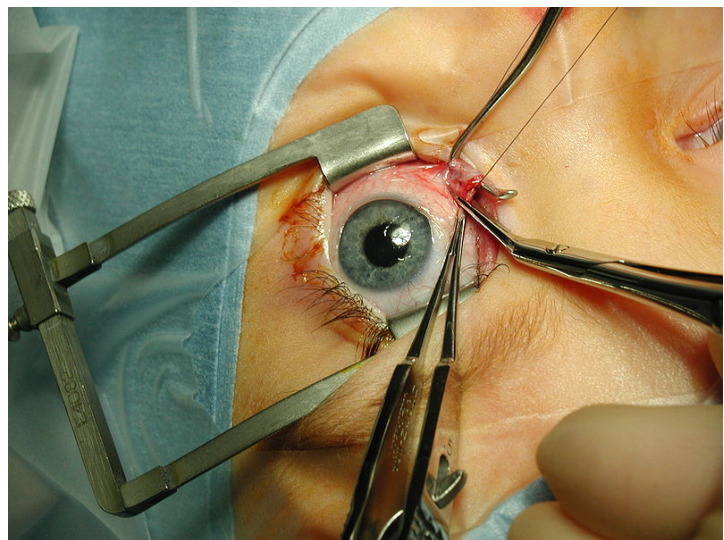
Eye muscle surgery

With approximately 1.2 million procedures each year, extraocular muscle surgery is the third most common eye surgery in the United States [23].

- Eye muscle surgery typically corrects strabismus and includes the following^[24] [25]:
 - Loosening / weakening procedures
 - Recession involves moving the insertion of a muscle posteriorly towards its origin.
 - Myectomy
 - Myotomy
 - Tenectomy
 - Tenotomy
 - Tightening / strengthening procedures
 - Resection
 - Tucking
 - Advancement is the movement of an eye muscle from its original place of attachment on the eyeball to a more forward position.
 - Transposition / repositioning procedures
 - Adjustable suture surgery is a method of reattaching an extraocular muscle by means of a stitch that can be shortened or lengthened within the first post-operative day, to obtain better ocular alignment [26].



Isolating the inferior rectus muscle



Disinserting the medial rectus muscle, after pre-placing vicryl suture

Oculoplastic surgery

Oculoplastic surgery, or oculoplastics, is the subspecialty of ophthalmology that deals with the reconstruction of the eye and associated structures. Oculoplastic surgeons perform procedures such as the repair of droopy eyelids

(blepharoplasty)[27], repair of tear duct obstructions, orbital fracture repairs, removal of tumors in and around the eyes, and facial rejuvenation procedures including laser skin resurfacing, eye lifts, brow lifts, and even facelifts. Common procedures are:

Eyelid surgery [28]

- Blepharoplasty (Eyelift)
 - **Blepharoplasty** is plastic surgery of the eyelids to remove excessive skin or subcutaneous fat.^[29]
 - **Asian blepharoplasty**
- Ptosis repair for droopy eyelid
 - Ectropion repair [30]
- Entropion repair
- Canthal resection
 - A **canthectomy** is the surgical removal of tissue at the junction of the upper and lower eyelids.^[31]
 - **Cantholysis** is the surgical division of the canthus.^[31]
 - **Canthopexy**
 - A **canthoplasty** is plastic surgery at the canthus.^[31]
 - A **canthorrhaphy** is suturing of the outer canthus to shorten the palpebral fissure.^[31]
 - A **canthotomy** is the surgical division of the canthus, usually the outer canthus.^[31]
 - A **lateral canthotomy** is the surgical division of the outer canthus.
- **Epicanthoplasty**
- **Tarsorrhaphy** is a procedure in which the eyelids are partially sewn together to narrow the opening (i.e. palpebral fissure).

Orbital surgery

- Orbital reconstruction / Ocular prosthetics (False Eyes)
- Orbital decompression for Grave's Disease

Other oculoplastic surgery

- Botox injections
- Ultrapeel Microdermabrasion
- Endoscopic forehead and browlift
- Face lift (Rhytidectomy)
- Liposuction of the face and neck
- **Browplasty** [32]

Surgery involving the lacrimal apparatus

- A **dacryocystorhinostomy** (DCR) or **dacryocystorhinotomy** is a procedure to restore the flow of tears into the nose from the lacrimal sac when the nasolacrimal duct does not function.^{[31] [33]}
- **Canaliculodacryocystostomy** is a surgical correction for a congenitally blocked tear duct in which the closed segment is excised and the open end is joined to the lacrimal sac.^{[31] [34]}
- **Canaliculotomy** involves slitting of the lacrimal punctum and canaliculus for the relief of epiphora^[31]
- A **dacryoadenectomy** is the surgical removal of a lacrimal gland.^[31]
- A **dacryocystectomy** is the surgical removal of a part of the lacrimal sac.^[31]
- A **dacryocystostomy** is an incision into the lacrimal sac, usually to promote drainage.^[31]
- A **dacryocystotomy** is an incision into the lacrimal sac.^[31]

Eye removal

- An **enucleation** is the removal of the eye leaving the eye muscles and remaining orbital contents intact.^[35]
- An **evisceration** is the removal of the eye's contents, leaving the scleral shell intact. Usually performed to reduce pain in a blind eye.^[36]
- An **exenteration** is the removal of the entire orbital contents, including the eye, extraocular muscles, fat, and connective tissues; usually for malignant orbital tumors.^[37]

Other surgery

Many of these described procedures are historical and are not recommended due to a risk of complications. Particularly, these include operations done on ciliary body in an attempt to control glaucoma, since highly safer surgeries for glaucoma, including lasers, non-penetrating surgery, guarded filtration surgery and seton valve implants have been invented.

- A **ciliarotomy** is a surgical division of the ciliary zone in the treatment of glaucoma.^[31]
- A **ciliectomy** is 1) the surgical removal of part of the ciliary body, or 2) the surgical removal of part of a margin of an eyelid containing the roots of the eyelashes.^[31]
- A **ciliotomy** is a surgical section of the ciliary nerves.^[31]
- A **conjunctivoanastrostomy** is an opening made from the inferior conjunctival cul-de-sac into the maxillary sinus for the treatment of epiphora.^[31]
- **Conjunctivoplasty** is plastic surgery of the conjunctiva.^[31]
- A **conjunctivorhinostomy** is a surgical correction of the total obstruction of a lacrimal canaliculus by which the conjunctiva is anastomosed with the nasal cavity to improve tear flow.^[31]
- A **corectomedialysis**, or **coretomedia lysis**, is an excision of a small portion of the iris at its junction with the ciliary body to form an artificial pupil.^[31]
- A **corectomy**, or **coretomy**, is any surgical cutting operation on the iris at the pupil.^[31]
- A **corelysis** is a surgical detachment of adhesions of the iris to the capsule of the crystalline lens or cornea.^[31]
- A **coremorphosis** is the surgical formation of an artificial pupil.^[31]
- A **coreoplasty**, or **coreoplasty**, is plastic surgery of the iris, usually for the formation of an artificial pupil.^[31]
- A **coreoplasmy**, or **laser pupillomydriasis**, is any procedure that changes the size or shape of the pupil.^[36]
- A **cycectomy** is an excision of portion of the ciliary body.^[31]
- A **cyclotomy**, or **cyclicotomy**, is a surgical incision of the ciliary body, usually for the relief of glaucoma.^[31]
- A **cyloanemization** is a surgical obliteration of the long ciliary arteries in the treatment of glaucoma.^[31]
- An **iridectomesodialysis** is the formation of an artificial pupil by detaching and excising a portion of the iris at its periphery.^[31]
- An **iridodialysis**, sometimes known as a **coredialysis**, is a localized separation or tearing away of the iris from its attachment to the ciliary body.^{[31] [36]}
- An **iridencleisis**, or **corencleisis**, is a surgical procedure for glaucoma in which a portion of the iris is incised and incarcerated in a limbal incision.^[31] (Subdivided into **basal iridencleisis** and **total iridencleisis**.^[38])
- An **iridesis** is a surgical procedure in which a portion of the iris is brought through and incarcerated in a corneal incision in order to reposition the pupil.^{[31] [39]}
- An **iridocorneosclerectomy** is the surgical removal of a portion of the iris, the cornea, and the sclera.^[31]
- An **iridocyclectomy** is the surgical removal of the iris and the ciliary body.^[31]
- An **iridocystectomy** is the surgical removal of a portion of the iris to form an artificial pupil.^[31]
- An **iridosclerectomy** is the surgical removal of a portion of the sclera and a portion of the iris in the region of the limbus for the treatment of glaucoma.^[31]
- An **iridosclerotomy** is the surgical puncture of the sclera and the margin of the iris for the treatment of glaucoma.^[31]

- A **rhinommectomy** is the surgical removal of a portion of the internal canthus.^[31]
- A **trepanotrabeculectomy** is used in the treatment of chronic open and chronic closed angle glaucoma.^[38]

See also

- LASIK
- Ophthalmology
- Topical anesthetic
- SEE-KID-Computer-assisted Simulation and Treatment of Eye Motility Disorders

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