Knowledge brings Healing

OPHTHALMOLOGY

Clinic and Polyclinic
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The most famous building in Munich is certainly the Frauenkirche. No building in the city centre can top the two towers of the Munich landmark. This guarantees an unmistakable view over the roofs of the old town. You can climb the steps or use the lift to get to the top of the nearly one hundred metre south tower.

Munich has a number of attractive parks to offer. English Gardens has offered its visitors trails, beautiful sunbathing and play areas and jovial beer gardens for 200 years.

The Olympic Tower in the Olympic Park ascends a good 291 metres. When the weather is good, the view is unmatched from the observation deck at 190 metres. The BMW Museum and the striking four-cylinder structure of the BMW corporate headquarters are in the immediate vacinity.

A 3 km² sports grounds was built in North Munich as a venue for the Summer Olympics in 1972. The Olympic Park. The bold tent-like roof construction has long since become the modern landmark of the city.
There are countless excursions in and around Munich for big and small. The Hellabrunn Zoo offers an impressive picture of the natural habitat of various animal species throughout the year. At the Sea Life Center in Olympic Park opened in 2006, the 10,000 examples of more than 120 ocean species can be marveled at. The castles in and around Munich are worth seeing in particular. The residence and most well-known castle in Munich „Nymphenburg“ lies at the heart of the city. Day trips to the surrounding lakes in the middle of a gorgeous mountain landscape are also very popular. For football and architecture fans alike, visiting Allianz Arena is a must. Everyone else also gets their money’s worth by surveying this artistic building. Guides and other information is available at www.arena-one.net.

All important information about the City of Munich (also in German & Arabic) is available at www.muenchen.de
GREETING

„It is only with the heart that one can see rightly; what is essential is invisible to the eye.“ All of us know this beautiful aphorism from Antoine de Saint-Exupery. It is also generally accepted. However, none of us want to be denied our eyesight since the sense of sight is essential for most of us. We depend on it and are thoughtful about its health.

Disease, genetic defects and accidents can make treating the eyes necessary. We are in good hands with Munich as the centre for science and research: two university hospitals, the Klinikum rechts der Isar of Munich Technical University and the Klinikum der Ludwig-Maximilians – University of Munich, have ophthalmology clinics with excellent reputations in research, teaching and patient care. The Science Council – the highest advisory body on scientific policy in Germany – has attested to the quality of both university hospitals.

This success didn’t come by chance. This encouragement of science and research has enjoyed special significance in Bavaria for many years. The Bavarian government has ensured conditions conducive to research and teaching for quite some time. This also includes the promotion of basic research in its overall breadth and depth.

Bavaria and especially Munich are an „Eldorado“ for excellent researchers, scientists and clinicians. They perform this outstanding work at the highest level for the well-being of patients. For this, we owe them a debt of gratitude and our recognition. Because it is most important that patients know they are in good hands!

Dr. Thomas Goppel
Bavarian State Minister for Science, Research and the Arts
DEAR READERS,

Welcome to the Ophthalmology clinic and polyclinic at the Klinikum rechts der Isar. My team and I have made it our goal to use all our expertise and opportunities for the restoration and preservation of your health and to attend you as best possible with personal dedication.

Interdisciplinarity is a trademark of the Klinikum rechts der Isar. As a university clinic, the ophthalmology clinic works together with other expert disciplines on complex diseases to guarantee comprehensive treatment tailored to your specific needs.

Since becoming director of the Ophthalmology clinic and polyclinic in 2005, we have been continuously working on fulfilling our role as a service provider for the well-being of the patient. As a university clinic, we not only function as a service provider for you and your family, but also in regard to medical training, ophthalmologist cooperation and medical research. We train students and young doctors as best possible, who together with our office-based colleagues and the latest knowledge from research contribute to again care for you ourselves as service providers.

Modern hospitals are often equated with facilities in which the sick lie. If you take closer look at the German designation „Hospital“ even though it is archaic, the English designation „hospital“ or the Italian „ospedale“, we find a close relationship to „hospitality“ or „ospite“ (guest in Italian) - a house of hospitality in which the sick are treated.

It is a promise to you and anyone interested to treat you and to the extent possible, meet you as guests. My invitation to my team is to be aware of the tasks and responsibilities of a host every day.

With this brochure, I hope we can offer you insight into the diversity of our daily work.

Prof. Dr. Dr. med. Chris P. Lohmann
Director of the eye clinic

„We cannot make our dream of making the blind see come true for everyone. But we have the possibility of preserving, protecting and improving eyesight with state-of-the-art technology, targeted diagnostics and precision therapy concepts.”
We are not just equipped for all ophthalmological diseases, but have a number of specialists with years of experience in various fields. Specially trained staff are available for any subfield of the ophthalmology clinic. Each senior physician has his/her own speciality and is there for you in words and deeds. In addition to precision diagnostics and comprehensive consultation, we are then able to guarantee the best possible treatment from experts.

Thanks to our many years of experience in the treatment of eye diseases and our team of experts, we are able to cover the complete conservative and operative spectrum of ophthalmology.

Special clinics have been established in our ophthalmology clinic in order to treat certain diseases specifically. In addition to the polyclinical outpatient clinic, each day of the week has a different treatment emphasis. You are examined and advised by experts in the respective field.

We also offer office-based colleagues the opportunity of having various special services, which they are unable to perform themselves, performed in our facilities.

These services include:

- Fluorescence angiography
- Optical coherence tomography
- Corneal topography
- Electrophysiology
- Corneal pachymetry
- Refractive and therapeutic treatment with the Excimer laser

The specialists determine the appropriate treatment tailored to you according to a precision diagnosis and comprehensive consultation. In addition to conservative treatments through medication, we are equipped for all operative interventions at the ophthalmology clinic:

- Tear duct surgery
- Plastic reconstruction
- Refractive laser and lens surgery
- Therapeutic Excimer laser treatment
- Cataract surgery
- Special implants
- Corneal transplantation
- Traumatology
- Glaucoma therapy with laser or operation
- Vitreous body and retina surgery (diabetes and retinal detachment)
- Macular surgery (Macular degeneration)
- Retina laser
- Strabotomies

A large number of operations can be performed as day surgery. If hospital admission is necessary, a modern ward with single and double rooms is available to you. All of the nursing staff are specially trained in ophthalmology and look after your well-being and wishes.
The white sclera forms the outside coating of the eye. The transparent cornea is located where light enters the eye. Joined to the sclera on the inside is the choroid with numerous blood vessels. The choroid travels forward into the ciliary body, which is responsible for suspending the lens in the capsular bag with its zonular fibres. The iris sits in front of the lens and forms the pupil. The pupil controls the incidence of light into the eye. We see the pigmentation of the eye as „eye colour“.

The internal tunic with pigment layer is called the retina. It contains sensory sells responsible for stimulus perception, stimulus processing, image formation, colour vision and light/dark vision.

The entrance of the optic nerve in the retina (optic disc = papilla) is called the „blind spot“ because there is no stimulus perception in this area.

The middle of the retina, the point of sharpest vision, is called the „yellow spot“ (macula). The interior space of the eye is filled with the vitreous body, a gel-like mass.
ALL MODERN PROCEDURES AND TECHNOLOGIES FOR DIAGNOSIS ARE AVAILABLE AT THE OPHTHALMOLOGY CLINIC. THESE INCLUDE IN DETAIL:

**CORNEAL TOPOGRAPHY**

Corneal topography is used to represent the curvature of the cornea. Based on the values and the imaging, the ophthalmologist can identify whether a pathological change to the cornea (sever astigmatism, corneal scar, tissue weakness in particular) is present.

**ABEERROMETER**

An aberrometer accurately measures high-order refractive errors in the retina. The refractive errors are often responsible for poor vision at twilight and at night. The aberrometer can be used to measure the refractive errors, but can only be corrected with a laser and not with glasses or contact lenses.

**CONFOCAL CORNEAL MICROSCOPE**

A confocal corneal microscope (HRTII Cornea Module) is used to create images of the layers of the cornea. Cells, nerve fibres of the cornea, pathological changes and signs of inflammation can be visualised.

**FLUORESCENCE ANGIOGRAPHY**

For fluorescence angiography, a dye is injected into the veins, which then spreads throughout the body and the vessels of the eyes through the blood. The dye makes it possible to better image and assess pathological changes in the retina (e.g. diabetes, macular degeneration).

**MEASURING THE THICKNESS OF THE NERVE FIBRE LAYER AND THE OPTIC NERVE**

For the early detection of glaucoma, measuring the nerve fibre layer in the retina plays an important role since glaucoma is associated with damage to the nerve fibres in its early stages. Retinal tomography (HRT) is also used to image and evaluate the optic nerve. Through digital computer documentation, the results can be easily compared and even slight degeneration detected early.
Examinations of the field of vision can localise defects in the field of vision and the correct diagnosis made. In our clinic, we have both manual kinetic (Goldmann) and static perimetry (Octopus).

The B-scan method is used to make a two-dimensional black/white image of the eyeball and orbit. This procedure is particularly important if unable to look into the eye, e.g. due to intraocular bleeding and for the diagnosis of retinal changes. Documentation of benign and malignant tumours in and around the eye is possible nearly exclusively with the B-scan method and of utmost importance.

The A-scan method is used to make a one-dimensional image and allows the accurate determination of the structures within the eye. The structures can be accurately distinguished and their area measured. Biometry for calculating artificial lenses represents a special form of the A-scan measurement. The structures involved in light refraction are measured with particularly high accuracy. An individually tailored artificial lens is then calculated based on the measurement results taking into account the radii of the corneal curvature.

Another special form of the A-scan ultrasound is the thickness measurement of the cornea using a high-frequency ultrasound signal. The thickness of the cornea is important for assessing the accuracy of intraocular pressure measurements and before refractive surgeries.

The electroretinogram (ERG) shows the electrical response of the retina to a light stimulus. It can distinguish and chart the potential of colour vision cells from those of light/dark vision cells.

The electrooculogram (EOG) measures the resting potential of the eye, which is higher in the light than in the dark. The ratio from the light and dark measurement sheds light on various retinal diseases.

The measurement of the visually evoked potentials (VEP) sheds light on the functional condition of all nerve structures, which are involved in the transmission of stimulus from the retina to the visual centre. The reaction to certain stimuli (light flashes, checkerboard pattern) are transmitted by precisely placed electrodes and displayed as different curves.
80 percent of all surgical interventions in ophthalmology can be performed under local anaesthesia. The procedure is selected depending on the duration and complexity of the operation: Topical anaesthesia, through eye drops for numbing the surface of the eye, e.g. for conjunctiva / cornea operations, cataract operation. Retrobulbar anaesthesia or parabulbar anaesthesia, through an anaesthetic injection behind (retro) or next to (para) the eye for intraocular interventions.

Should surgery under local anaesthesia be unavailable due to type or complexity, experienced physicians from the Department of Anaesthesiology are there to support us.

The Department of Anaesthesiology (Director: Univ. Prof. Dr. med. Dipl. Phys. Eberhard Kochs) of the Technical University of Munich, Klinikum rechts der Isar is state of the art and highly experienced staff are available for anaesthesiological treatment. In collaboration with our team, the anaesthetists assume dual responsibility for interventions (examination, operation) in your perioperative care:

- They monitor and maintain all important bodily functions („Standby“), in particular heart, circulation and respiration. By monitoring these functions, the anaesthetists ensure your safety and make it possible for the treating ophthalmologist to concentrate fully on the procedure itself.

- They administer short-acting sedatives, which lead to twilight sleep (sedation) and limit the capacity to remember the procedure and/or central analgesics. Depending on need, sedatives and analgesics can be administered alone or in combination („analgesic sedation“).
To prevent possible complications, which can result from the procedure and from the administration of sedatives, analgesics and anaesthetics or other medications, the anaesthetist performs a survey of your medical history in regard to preexisting or secondary conditions as well as possible previous surgeries, anaesthesia and medication regimens. In addition, a physical examination is performed and if necessary, additional examinations (e.g. blood test) and/or pretreatment arranged. An indwelling cannula is placed in a vein shortly before the procedure. It is used to administer necessary medicines during the procedure.

On occasion, the anaesthetist assisting you may transition from twilight sleep to general anaesthesia, e.g. if the duration of the procedure is extended significantly. Anaesthesia can also be necessary if the analgesic and if necessary, the local numbness is unable to adequately switch off the pain. The exact procedure and potential risks and unwanted side effects are discussed with you in the context of a comprehensive preoperative discussion.
The cornea has the greatest share of the overall refractive power of the eye. Therefore, the transparency and regularity of its surface are of greatest importance for unclouded vision.

The cornea is transparent and normally a bit more than half a millimetre thick at its centre. It consists of five layers, each of which having an important tasks. The cornea is a very sensitive part of our body. Even minor irritations or stimuli lead to a reflexive closing of the lids and increased tear production. This sensitivity is due to a high percentage of nerve fibres prevalent in the cornea. The sensitivity can be reduced as a result of some diseases.

**INFLAMMATION OF THE CORNEA**

Inflammation of the cornea can have a number of causes. Fungi, bacteria or viruses can be the cause on the one hand and on the other, inflammation is often the result of a disrupted moistening of the cornea with tear fluid. The latter is often the case in older people.

The picture to the right shows corneal clouding after keratoconjunctivitis epidemica, a contagious viral infection of the cornea.

**STRUCTURAL CHANGES**

The term structural changes generally means ingrowths, ulcers and various degenerations of the cornea. These changes often go unnoticed by the person affected because they are often found at the edge of the cornea. Ulcers and ingrowths can normally be treated relatively well. The ophthalmologist can identify degenerations as grey/white formations in the cornea. Those affected notice clouding depending on the position of the disease. Degenerations can be treated in the least number of cases.

**KERATOCONUS**

Keratoconus involves tissue weakness, in which the cornea is weakened at a point (see arrow) and at the same time bulges out (see coloured representation below). The cause of the keratoconus is largely unknown. However, because this disease most often occurs in childhood and develops in young adulthood, a congenital cause is assumed. The progression of the disease stops spontaneously in some cases and on others, visual acuity and clinical findings worsen rapidly.
CORNEAL OPERATIONS

In some cases (certain corneal diseases or e.g. after very severe inflammation of the cornea), the only option to restore the clarity and transparency of the cornea is to transplant of a donor cornea.

If a superficial injury is present with a corneal disease, which cannot be healed with drops and ointment, there is the option of attaching a so-called „amnion membrane“ (thin membrane taken from the amniotic sac of newborns) to allow the injury to heal without difficulty.

On the one hand, scaring of the cornea can impair vision if centrally located. On the other hand, scaring causes instability of the corneal tissue and often cause recurring ruptures of the surface of the cornea (epithelial layer), which is very painful and can lead to severe visual impairment. An Excimer laser can be used to treat scaring, which is not located too deep in the cornea. The laser beam is used to smooth the surface and remove scaring. The cornea can then heal in peace.

This method was developed by Prof. Dr. med. Theo Seiler, Director of the IROC-Klinik in Zurich, Switzerland and tested in numerous studies. The crosslinking operation has been used since December 2006 for the treatment of keratoconus in the course of normal clinical interaction at the Klinikum rechts der Isar. The combination of vitamin B2 eye drops and UV light stimulates the crosslinking of the weakened keratocytes (fibroblastic stromal cell of the cornea) of the cornea. Like a net, which receives additional bracing to become more tear resistant, the cellular structure of the cornea is strengthened with crosslinking to bring the progression of the tissue weakness to a stop. The UV rays are harmless to the retina because the wavelength is exactly 370 nm.
LASER TREATMENT

Many people dream of life without glasses or contact lenses. Today, a number of surgical options are normally available to easily correct a purely refractive error. Surgery is unavailable in only very complex cases. In addition to a comprehensive consultation, thorough preliminary examination, precision execution of the surgery and frequent checkups, selection of the right surgical procedure plays an extremely important role.

Laser beams are used to adjust the refractive power of the cornea, the ametropia of the eye, and the refractive error thus corrected.

EPI-LASIK

A microkeratome (a type of miniplane with integrated blunt blade) is used to detach and push the top layer of the cornea (epithelial layer) to the side. The laser beams then correct the refractive error. Once the laser treatment is complete, the epithelial layer is repositioned and covered by a protective contact lens until healed.

LASIK

The microkeratome has a sharp blade, which is not used to prepare the surface as in Epi-Lasik, but to place a cut in the top third of the cornea. The resulting flap is also folded to the side and then repositioned after successful laser treatment. No protective contact lens is required.

The same laser, an Excimer laser, is used for each technique.
**LENS SURGERY**

If laser treatment is not possible due to the type and degree of ametropia, the implantation of a specially manufactured artificial lens must be considered.

This surgical method is consistent with cataract surgery. Ultrasonics break up the natural lens, which is then suctioned away and replaced by an artificial lens to correct the refractive error. Modern artificial lenses make it possible to correct somewhat complex visual defects, e.g. correction of an astigmatism (toric lens) or correction to to various distances (multifocal lens).

These artificial lenses are normally implanted in addition to the natural lens in patients with more severe nearsightedness. Which artificial lens is used is decided by the ophthalmologist based on the type of refractive error. The presence of a severe astigmatism, ametropia, presbyopia or other refractive error effects the decision.

The therapeutic classes are based on experience on the one hand and on the other, specified by the Commission for Refractive Surgery.

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<th>Farsightedness</th>
<th>Astigmatism</th>
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<td>Epi-LASIK</td>
<td>up to -8 dpt.</td>
<td>up to +5 dpt.</td>
</tr>
<tr>
<td>LASIK</td>
<td>up to -3 dpt.</td>
<td>up to +4 dpt.</td>
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<tr>
<td>CLE</td>
<td>from +3 dpt.</td>
<td>conditional</td>
</tr>
<tr>
<td>PHAKIC IOL</td>
<td>from +4 dpt.</td>
<td>conditional</td>
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Independent of the method is the complexity, apart from the eye surgery itself, in the correct evaluation of the examination findings. A treatment optimised for the patient is only possible when the findings are interpreted correctly.
Cataract includes all diseases of the eye identified by a clouding of the natural crystalline lens. In 90% of cataract cases are age related. Cataract normally becomes noticeable after the age of 65.

**In a few cases, other causes are responsible for cataract formation:**

- Congenital cataract
- Eye injury
- Medication regimen
- Previous eye surgeries
- Radiation exposure
- Inflammation of the eye
- Syndromes or diseases (e.g. Morbus Down, Diabetes mellitus)

Because cataract involves a slow progressing process, the patient often feels largely unaffected in the beginning. One’s surroundings appear blurred, dull and cloudy, contrasts and colours washed out. Cataract often becomes noticeable due to severe glare. An ophthalmologist can use a slit-lamp examination to easily diagnose cataracts.

**Surgery is the only option** to treat a cataract. Depending on the stage of clouding and how severely you are affected, your ophthalmologist advises you when the best time for cataract surgery is. Cataract surgery is very safe today and only takes about 10 minutes. Through a small incision, an ultrasound machine break up the natural lens which is then suctioned away. An artificial intraocular lens is then inserted into the eye. The intraocular lens can also correct a severe refractive error.

As with any surgery, cataract surgery involves a risk of complication (e.g. pain, infection, aftercataract, problems in wound healing, etc.). Of course, your ophthalmologist informs you of the risks and complications before surgery.
PERFORMING CATARACT SURGERY

Cataract surgery is one of the most frequently performed overall. It is usually performed as day surgery. Only when outpatient surgery is not possible due to medical reasons is the procedure performed inpatient. Local anaesthesia is normally used with anaesthetic eye drops or an anaesthetic injection administered behind the eye. Only in a few exception cases is it necessary to perform surgery under general anesthesia.

Only the latest artificial lenses are used at our clinic for all patients. Special lenses for implantation have been developed for special refractive errors or conditions. There are other benefits in addition to correcting a refractive error.

Multifocal intraocular lenses work like varifocal lenses within the eye. They create several focal points, but at least on for distance and one for nearby (2 focal points = bifocal, several focal points = multifocal). This type of lens has several variable zones (identified by rings in the photo) to produce a sharp image at various distances.

The natural lens of the eye has the capability of stretching and adjusting to images near and far. This characteristic is called accommodative capacity. However, this capacity is lost over time. The idea in developing an accommodating lens was to replace the naturally rigid lens with an artificial lens, which can adjust to various distances. Unfortunately, the desired affect has not been achieved in clinical studies. The ability of the special lens to adjust to near and far is limited, making it necessary for the patient to wear reading glasses in some cases.

To correct a moderate astigmatism, which is difficult to correct with glasses, there is the option of implanting a so-called toric lens.

Special yellow intraocular lenses (photo left) are particularly suitable for patients with age-related macular degeneration. The yellow colour of the lens, which the patient does not perceive subjectively, works like sunglasses in the eye and protect the already diseased retina against UV rays.

With the latest generation of artificial lenses, there is even the opportunity to perform a “fine adjustment” after implantation. In other words, minor refractive errors can be corrected by exposing the implanted lens to UV light. The special material of the artificial lens reacts to the UV light by expanding or contracting, thus correcting a refractive error already in the eye.
GLAUCOMA

This disease occurs more often in older patients than young patients and is usually characterised by increased intraocular pressure, but can also occur when intraocular pressure values are normal. A glaucoma screening examination is generally advisable after age 40, but must be paid privately. We also offer this service to our patients.

**Risks for glaucoma can be:**
Glaucoma in direct relatives, nearsightedness, severe farsightedness, longer cortisone treatment, other diseases of the eye.

**FORMS AND CAUSES**

**PRIMARY OPEN-ANGLE GLAUCOMA**

Primary open-angle glaucoma involves a disturbance in the drainage of the aqueous humor in the anterior chamber of the eye.

**PRIMARY CLOSED-ANGLE GLAUCOMA**

With primary closed-angle glaucoma, a narrowing of the iridocorneal angle interrupts drainage of the aqueous humor. Complete congestion of the aqueous humor means a sudden extreme increase in intraocular pressure (glaucoma attack) – this is an emergency and must be treated immediately.

**Symptoms of a glaucoma attack and be the appearance of bright circles in the dark or at dusk.**

A secondary glaucoma is associated with another disease or injury.

**SECONDARY GLAUCOMA**

So-called **NEOVASCULAR GLAUCOMA** is included in the group of secondary glaucomas. Chronic oxygen deficiency in the eye (e.g. after vascular occlusions in the eye or with diabetes) stimulates the formation of new vessels in the eye. The new vessels grow into the iridocorneal angle and iris, and also cause a disturbance in the drainage of the aqueous humor followed by high intraocular pressure.

**PIGMENTARY GLAUCOMA** results from an abnormal release of pigment from the iris, which then visibly obstructs the lens and damages the outflow channels of the trabecular meshwork.

**PEX GLAUCOMA**

Pseudoexfoliation glaucoma (PEX glaucoma) is similarly explained. This form of glaucoma is characterised by proteinosis on the lens and accumulation in the iridocorneal angle resulting in its displacement.
To measure intraocular pressure, the so-called applanation tonometer is used to place a small probe against the cornea. The force required to flatten an area of the cornea corresponds to the intraocular pressure. Numbing drops are administered to the eye to make the procedure painless.

Establishing the field of vision (perimetry) is used to determine the extent of existing damage.

The slit lamp is a portable microscope used by the ophthalmologist to evaluate the anterior segment of the eye and the retina. It is important to evaluate the iridocorneal angle using a gonioscope and to evaluate the optic disc with a special magnifying glass.

Various studies have shown that the corneal thickness in glaucoma patients differs from the average thickness and is thicker or thinner than normal. This characteristic can affect the measurement of intraocular pressure. The values may be too high or too low (by up to 10 mmHg).

Retinal tomography (HRT) is used to accurately determine whether and to what extent the nerve fibre tissue of the optic disc is damaged. Even the slighted changes can be shown for patients with glaucoma.

Conservative treatment consists of intensive eye drop therapy and regular check-ups by the ophthalmologist. Laser treatment or an operative procedure is performed for glaucoma, which cannot be treated with eye drops.

For selective laser trabeculoplasty, a special, very accurate laser beam is used to expose the clogged iridocorneal angle. This method prevents the need for a larger operative procedure or can be used with patients, who have to frequently use a high volume of eye drops, to achieve a reduction in intraocular pressure. Advantage: Immediate reduction in pressure, painless for the patient, repeatable, no scarring in the iridocorneal angle.

In this operation, a microsurgical technique treats the clogged iridocorneal angle.
A number of different clinical pictures of the vitreous body and retina may be responsible for blurring of vision. Because diseases of the retina are very complex, the patient's symptoms and changes present must be accurately defined to make the correct diagnosis.

**Muscae Volitantes**

*Muscae volitantes* are described as spots before the eyes caused by opaque cell fragments in the vitreous humor. Those affected notice small shadows, which follow eye movements in front of a bright background in particular (*flying mosquitoes*). The spots are distracting, but do not affect the central vision. Vitreous deposits caused by metabolic disorders such as synchysis scintillans (see picture) can lead to such manifestations. As long as there are no associated diseases of the retina, surgery is only indicated if the patient extremely bothered.

**Arterial Occlusions**

Retinal artery occlusions are caused by an embolism in the majority of cases. The central artery occlusion leads to sudden unilateral loss of sight with no pain. With an artery occlusion, the patient notices a sudden painless blurring of vision or visual field defects.

**Venous Occlusions**

Venous thromboses in retinal vessels frequently occur with arteriosclerosis (*arterial calcification*), high blood pressure and diabetes. Such thromboses only cause impaired vision if edema (swelling caused by excessive accumulation of fluid) of the optic disc (papilledema) or the visual centre (macular edema) is also present.
Macular edema (accumulation of fluid at the point of sharpest vision) can also be caused by diabetes, the wet form of age-related macular degeneration or inflammation within the eye. Various medications and surgical treatment methods can be used to treat macular edema depending on the cause.

With epiretinal gliosis, a membrane forms over the point of sharpest vision. Contraction of this membrane causes the retina to distort resulting in a distorted view for the person affected and a slow decline in visual acuity. Traction by the membrane on the retina and its vessels can lead to further bleeding and retinal detachment. The epiretinal gliosis can surgically removed, but there is no drug therapy available.

If there is retinal detachment (ablatio or amotio retinae), it is extremely important that the retina be surgically reattached as soon as possible, surgical reattachment because lack of nourishment can stop the function of the sensory cells. There can be various causes of retinal detachment: Retinal hole and tear, vitreous body detachment with traction on the retina, fluid discharge under the retina, injuries, inflammation or as a result of other diseases of the eye, e.g. diabetes.

The warning signs of retinal detachment are red spots in the field of vision or light flashes. If the detachment has already occurred, the patient perceives a dark wall from below (if the detachment starts at the top), a black curtain from above (if the detachment starts at the bottom) or from the side depending on the starting point. In both cases, the patient must seek an ophthalmologist immediately!
Diabetes mellitus is a chronic disease. Over years, changes occur in the blood vessels throughout the body due to increased blood glucose concentrations. Even the eyes are affected by the consequential damages of diabetes mellitus.

Early detection of changes in the eyes caused by diabetes together with good blood glucose control is the best method of protecting and preserving visual acuity.

Diabetic retinopathy is not associated with any impairment in visual acuity for the patient initially. Deterioration in visual acuity comes along only later. Changes in the retina have already occurred if the patient affected does not notice any visual impairment for some time. Therefore, early diagnosis and prompt treatment start is very important in maintaining eyesight. Therefore, we recommend regular examination of the ocular fundus by an ophthalmologist if you suffer from Diabetes mellitus or its symptoms.

Visual impairment is initially caused when:

- Changes to the vessel walls lead to fluid discharge or bleeding in the retina
- Hypoxia leads to the formation of new diseased blood vessels

About 60 percent of all Type II diabetics suffer from diabetic retinopathy.

The ophthalmologist initially recognises the disease through slight bleeding and small aneurysms in the retina. In addition, there are changes in the veins and other small blood vessels of the eyes. In this study, affected patient yet perceive still no visual impairment even though the ophthalmologist can clearly see diabetic changes in the retina.

Deposits form and fluid collects at the point of sharpest vision, which leads to a decline in central visual acuity.
Poor blood flow in the vessels initially leads to hypoxia in the retina, which leads to the formation of new blood vessels, a natural repair mechanism. However, these are not of the same quality as normal blood vessels, but are more likely to burst thus causing haemorrhaging which negatively impacts visual acuity. This process can cause still other complications such as retinal detachment.

**CAN IT BE PREVENTED?**

The longer the patient suffers from diabetes and the worse glucose levels are, the greater likelihood retinopathy will develop. Most important is the long-term glucose level reading. This so-called Hba1c value should preferably be under 6%.

Just as important are good blood glucose control, not smoking, healthy diet and physical activity.

**WHAT CAN YOU DO?**

Unfortunately, there has been no effective medications to favourably treat diabetic retinopathy. Therefore, the priorities in early studies of the disease were blood glucose control and blood pressure regulation. Laser treatment has been indicated for changes in the retina in the area of the point of sharpest vision (macula) and for the occurrence of new blood vessels. This can maintain existing visual acuity in more than 50% of cases independent of initial findings. Should the diabetic retinopathy progress with recurring haemorrhaging in the vitreous space or lead to retinal detachment despite adequate laser treatment, surgery is recommended. With a so-called vitrectomy, the vitreous haemorrhages are removed and the lifted retina reattached as necessary. The new blood vessels are cauterised at the same time. In many cases, surgery can restore a certain visual acuity and depending on blood glucose control, a stable result achieved on the eye.

**Periodic examination by the ophthalmologist**

We recommend the following check-up intervals:

1. Diabetics without any previously know diabetic retinopathy should have their eyes examined once annually.

2. If changes are determined, the ophthalmologist creates an individualised plan which shows how often medical examinations should be performed (normally quarterly).
DRY AGE-RELATED MACULAR DEGENERATION (AMD)

**AMD IS A TYPE OF „METABOLIC DISEASE“ OF THE MACULA (= POINT OF SHARPEST VISION) AND IS DIVIDED INTO TWO FORMS:**

The metabolism in the retina can deteriorate with age and deposits („drusen“) can form in one of the retinal layers. These drusen multiply and expand in a slow process. The overlying retinal cells are poorly nourished and can break down as a result. The closer the drusen to the point of sharpest vision, the worse the visual acuity.

**Wet AMD** poses a much greater risk to eyesight. It progresses much faster and more aggressive than the dry form of AMD. New blood vessels form under the drusen („neo-vascularisation“). These are not of the same quality as conventional blood vessels because their walls are much thinner. As a result, they burst very easily and lead to bleeding in the retina.

**RISK FACTORS**

- Smoking
- AMD in the family history
- Vitamin and mineral deficiencies in the diet
- Genetic (complement factor H / CFH)
- Gender – Women are apparently at greater risk than men
- Skin colour – Light-skinned people are more likely to suffer from AMD than dark-skinned people

**PREVENTION AND TREATMENT**

A balanced diet with fruits and vegetables especially broccoli and red peppers (Vitamin A, C and E, lutein, zinc, copper), regular physical activity and protection against excessive UV radiation help to prevent AMD. In order to ensure early detection and treatment, you should regularly visit your ophthalmologist starting at age 50. Your ophthalmologist can also advise you on taking additional vitamin preparations.

There has been no effective treatment for the **dry form** of the disease to date. However, there are indications that taking lutein and vitamin preparations can have a positive effect on the course of the disease.
Contrary to the wet form of AMD, there are several treatment options available, which cannot restore lost eyesight, but can maintain the remaining eyesight and stabilize the findings.

For PDT, a dye is injected via the arm vein into the bloodstream and makes its way into the blood vessels of the eyes. „Non-thermal“ (cold) laser light activates the dye and thereby seals the newly formed diseased blood vessels to prevent bleeding. In order to achieve a satisfactory result, the PDT is normally repeated several times at intervals of approx. three months.

A thermal (hot) laser beam is used to coagulation the newly formed diseased blood vessels to prevent further ingrowth. However, the procedure always destroys healthy retinal tissue, which can lead to blurring of vision. For this reason, LC is only used in cases where the damage lies outside the visual centre.

**ANTI-VEGF (ANTI-VASCULAR ENDOTHELIAL GROWTH FACTOR)**

VEGF is a growth factor, which stimulates the growth of new diseased blood vessels in the retina. So-called Anti-VEGF drugs are being developed to counteract this process and to prevent the formation of new blood vessels. In individual cases, a remission of existing vessels has even been described, but this is rare. For a successful treatment, the Anti-VEGF therapy must be repeated often. These drugs are administered by injection into the inner eye under sterile conditions in the OR.

**“LOW VISION” – MAGNIFYING VISUAL AIDS**

Even when surgical or drug therapy no longer shows any effect, vision can still be improved at certain distances. Magnifying visual aids can make reading and watching television possible again or easier. There are special glasses, magnifying glasses and reading devices for at home and on the road to make life easier.
From an ophthalmologist’s perspective, it is highly recommended that every child undergo a routine examination by an ophthalmologist by age two at the latest. Family stresses or abnormalities should prompt parents to seek an immediate eye examination early. Strabismus is usually described as constant or recurrent malposition of the eyes. Strabismus is not only a disfigurement, but often causes a severe visual impairment. The earlier the strabismus occurs in life and the later it can be treated by the ophthalmologist, the more severe the visual impairment is. The chances of success for any treatment decline significantly at school age. Cross-eyed babies and infants need early treatment.

**Strabismus is not harmless or just cute. You do not just “grow out of it”. It frequently causes unilateral amblyopia and seriously interferes with three-dimensional vision should treatment not be introduced quickly.**

The eyes must look in the same direction for us to orient ourselves in space. Each eye perceives a slightly different image, which the brain combines and merges into a single three-dimensional image. When the eyes deviate, the difference of both images is so great that the brain cannot adequately join the images into a single visual impression resulting in double vision, which can lead to considerable visual impairment.

In childhood, the brain struggles against the „optical confusion“ by suppressing the image from the strabismic eye. However, this process has disastrous consequences: the unused eye becomes lazy (amblopic) over time.

Amblyopia is described as dimness of vision in an otherwise healthy eye. Timely diagnosis and subsequent treatment is of utmost importance because without treatment, 90 percent of all children with a unilateral strabismus develop unilateral amblyopia.
In order to successfully treat a strabismus, the ophthalmologist must work together with an orthoptist to determine the cause.

In approx. 50 percent of children, the cause of a convergent strabismus is an incorrectable refractive error. The error normally involves slight to severe farsightedness. In many such cases, glasses are used to eliminate or reduce the strabismus.

For other forms of strabismus not a result of a refractive error, special spectacle lenses (prisms) can often reduce the angle of deviation so that the unequal images merge. The position of the eye remains the same.

The surgical treatment of the strabismus is necessary in about half of all children. The procedure is sometimes a prerequisite for further measures. Surgery does not immediately improve three-dimensional vision and does not eliminate weakness. This requires further treatment. Surgery also does not eliminate the need for glasses. Only the position of the eyes is corrected. Surgery is performed by the ophthalmologist under general anaesthesia. The eye is neither „cut open“ nor „removed“. Only the easy-to-heal conjunctiva is opened to correct the position of the eye muscle.
STRUCTURE AND FUNCTION OF THE LACRIMAL DUCTS

Tears are formed in the lacrimal glands. Tears wet the eye, prevent the surface from drying out and protect against infectious or allergic particles. A film of tears covers the eye every time you blink. Tears flow via the lacrimal puncta from the lacrimal sac, which is hidden behind the nasal wall.

CLINICAL PICTURES OF THE LACRIMAL DUCTS AND THEIR TREATMENT

With this inflammation, the mother often notices tear production in both eyes and with pressure on the lacrimal sac, purulent secretion is discharged from the lacrimal punctum. The cause is usually a developmental disorder, which often improves after several weeks. If there is no improvement, decongestant, anti-inflammatory eye drops are given as treatment. Should this also lead to no significant improvement, the lacrimal ducts should be probed (short anaesthesia).

Those affected note persistent tearing. The most obvious signs for the ophthalmologist are a lacrimal lake on the edge of the lid and the resulting overflow of tears (epiphora). The cause of the disorder can be previous tear duct inflammation, an injury involving the tear duct or the advanced age of the patient. A disease of the nose, e.g. polyps, can often be the cause of tear duct obstruction. After anaesthetic drops are administered, the lacrimal ducts are flushed to see whether the stenosis can be cleared. If not, a lacrimal duct endoscopy must be performed.
An acute inflammation of the lacrimal sac most often occurs in older patients. Visible symptoms are swelling and redness of the inner canthus. In addition, the affected eye waters and the patient feels pain. Often the cause is a bacterial infection, previous blocked tear duct or blocked tears. The inflammation is treated with antibiotics, usually tablets, and possible scarification of the abscess. Surgery to restore the lacrimal drainage system after the acute inflammation subsides is usually inevitable.

Bacteria is usually the cause of this disorder and emanates from the conjunctiva. The patient notices severe acute swelling, redness of the upper lid and pain. Because the inflammation can also occur as a side effect of scarlet fever, measles, mumps or influenza and frequently occurs in children. Treatment includes warm, moist compresses and antibiotic therapy with eye drops.

PLASTIC SURGERY ON THE EYELID

Plastic surgeries on the eyelid can be cosmetic and therapeutic in nature. Eyelid surgery is described as cosmetic if performed for appearance only without adversely affecting the health. Eyelid surgeries are always therapeutic when discomfort or disorders occur based on the altered position of the eyelid or the presence of swelling (reduced vision, pain, inflammation). Some examples follow.

With an ectropion, the lower lid is turned outward exposing the conjunctiva. In the long run, it is usually results in an inflammation process of the lids and conjunctiva. The lower lid turns inward with an entropion. Constant rubbing of the eyelashes causes a scratch and the sensation of a foreign body in the eye. This can lead to chronic inflammation of the conjunctiva and cornea.

Relaxation of the upper lid results in blepharochalasis. If blepharochalasis occurs, the disease is described as dermatochalasis (floppy lid).

The familiar chalazion and hordeolum, if ointment therapy is unsuccessful, can be easily removed surgically.

Plastic reconstruction of the eyelids after an injury or removal of a growth is usually required to prevent abnormal inflammation or change caused by scarring on a continuing basis.
A matter of course for us as a university clinic is the continuous discussion of scientific questions. Our motivation is also to provide you with not "only" the best possible treatment, but also to develop new treatment alternatives. In order to provide you with new positive findings from experimental science as quickly as possible, clinical research is our priority. We are engaged in research on the national and international level.

THE FOLLOWING PRODUCTS AMONGST OTHERS ARE IN PROGRESS AT THE OPHTHALMOLOGY CLINIC:

GLAUCOMA RESEARCH
A project to develop radioactive glaucoma drainage implants is being supported by the Bavarian Research Fund.
Aspects of circulatory pathologies in various forms of glaucoma are being studied in our own perfusion laboratories of the ophthalmology clinic. The ophthalmology clinic is also a partner in European multicentre studies for the medical treatment of glaucoma.

DRY EYE
At the forefront of research is the development of a controlled drug release system. In this context and in cooperation with Prof. Dr. Göpferich of the Institute for Pharmaceutical Technology at the University of Regensburg, a new drug delivery system, which is currently being evaluated in a clinical study.

PRODUCTION OF AN ARTIFICIAL CORNEA
The demand for corneas for transplantation is much greater than the supply. Therefore, increased effort is being made to produce organs and tissues from adult stem cells. This project is being carried out in collaboration with a workgroup under the direction of Dr. May Griffith at the University of Ottawa, Canada. The studies are currently at the animal testing stage.

AGE-RELATED MACULAR DEGENERATION
In the framework of international multicentre studies, the latest drugs for treating wet macular degeneration are being clinically tested.

REFRACTIVE SURGERY
We use state-of-the-art Excimer lasers at 1000 Hz in refractive surgery. Until now, these have been commercially unavailable and we are the only centre worldwide currently using this laser clinically. In addition, femtosecond lasers are being developed together with industry for use with LASIK or corneal transplantation.
THE EYE OR

In our new eye OR built in 2006 is used for both outpatient and inpatient eye surgeries. The friendly OR staff is prepared for any eventualities and is there for you before, during and after the surgeries.

OPHTHALMOLOGY WARDS 3/7 AND 3/8

If admission to the clinic is necessary for surgery or intensive treatment, our new state-of-the-art ophthalmology wards with 24 rooms are available to you.

In order to offer you more comfort and service, each patient room was completely rebuilt in 2007 and 2008 (with bath and toilet in each room, of course). Appealing waiting areas have been integrated and a new nurse base and separate registration desk opened to make your stay with us as comfortable as possible.

All of the nursing staff are specially trained in ophthalmology and look after your well-being and wishes.
THE OPHTHALMOLOGY CLINIC FROM A TO Z

OUTPATIENT DEPARTMENT
The outpatient department of the ophthalmology clinic is on the 2nd floor of building 503 of the Klinikum rechts der Isar. The porter at the main entrance is happy to give you directions. In the outpatient department of the ophthalmology clinic has a coffee dispenser, as well as a snack and drink dispenser.

REGISTRATION DESK
There are two registration desk in the ophthalmology outpatient clinic: one for patients with appointment and one for patients without appointmen for emergencies during the day. In order to keep wait times to a minimum and ensure a smooth process, it is important to schedule an appointment for treatment.

Hours of operation:
- Registration with appointment
  - Monday – Thursday 7:30 – 16:00
  - Friday 7:30 – 14:00
- Registration without appointment
  - Monday – Friday 7:30 – 16:00

LIBRARY
You can borrow books and audiobooks from the patient library on the ground floor free of charge during your inpatient stay. For non-mobile patients, library employees also come to the individual wards with a selection of books.

LETTERS / STAMPS
The clinic has a stamp machine and a letterbox in front of the main entrance. Postcards can be purchased from the kiosk in the lobby.

CAFETRIA
You and your family members can get breakfast and lunch in the cafeteria in the foyer of the clinic. Sweet and hearty snacks, as well as warm and cold drinks are always available.

SINGLE AND DOUBLE ROOMS
Both of our state-of-the-art ophthalmology wards have single and double rooms nearly exclusively. Although the ophthalmology clinic team strives to find the right solution for each patient, we ask for your understanding if we are not always able to accommodate you in the desired room.

HAIRDRESSER
The services of the clinic salon in the main hall are available:
- Monday 9:00 – 14:00, Tuesday – Friday 9:00 – 18:00

HOSPITAL CHAPLAINCY
Full-time Protestant and Catholic hospital chaplains hold regular church and many other services. Their work on the wards is complement by the dedication of voluntary employees.

NOTFÄLLE
Doctors are available at the Klinikum rechts der Isar around the clock in case of emergency. The drop-in centre for emergencies before 7:30 and after 16:00, as well as on Sundays and holidays is the emergency department (east entrance of the clinic) or between 7:30 and 16:00, the polyclinic of the ophthalmology clinic.

OP
The operating room of the ophthalmology clinic is located on the 1st floor in building 503. A sign identifies the outpatient OR registration desk.

ORIENTIERUNG
Should it be your first time at the Klinikum rechts der Isar, the „green ladies“ in the foyer help orient you and accompany you as needed. The ophthalmology clinic is divided into three floors:
1. Floor Ophthalmology wards 3/7 and 3/8 and operating rooms
2. Floor Ophthalmology outpatient clinic with registration desk
3. Floor Function diagnosis, paediatric and neuro-ophthalmology with visual training

In the building adjoining the ophthalmology clinic (Trogerstraße 32) is the Glaucoma outpatient client on the third floor.
Because the Klinikum rechts der Isar is centrally located, parking around the clinic is not optimal. There are only a few parking places in the clinic’s own parking on Trogerstraße (east clinic entrance / emergency department). However, there are numerous parking options in the surrounding multi-storey car park (Einsteinstraße and Prinzregentenstraße).

Wheelchairs are available at the front desk of the main entrance of the clinic for handicapped and non-mobile patients. The green ladies are happy to help you during transport.

The „green ladies“ of the clinic voluntarily offer their help to you:

- Pilot service: You are received at the main entrance and accompanied to the wards and outpatient clinics.
- Visiting service: The green ladies take care of smaller errands during your inpatient stay and accompany you during walks (also in several foreign languages).
- Entertainment: The green ladies organise concerts, readings, slide shows, as well as markets and bazaars within the clinic. Posters announce event dates.

In the outpatient department of the ophthalmology clinic has a coffee dispenser, as well as a snack and drink dispenser. The cafeteria in the foyer of the clinic also offers snacks, breakfast and lunch.

Social counseling services support and advise you in applying for and organising rehabilitation measures. In addition, social services council you and your family members in social, social law and psychosocial questions.

Wards 3/7 and 3/8 are part of the ophthalmology clinic. They are located on the 1st floor of the ophthalmology clinic in building 503. The porter at the main entrance is happy to give you directions.

If you already have an inpatient appointment with us, it is important that you register at the general hospital admission. It is located on the ground floor in the foyer. The porter at the main entrance is happy to show you the way.

Public coin-operated telephones are not far from the main entrance.

Please pay attention throughout the clinic to your articles of value and do not leave them unattended. There are lockable cabinets in the hospital rooms on the wards. The Klinikum rechts der Isar can assume no liability for your personal articles of value or cash.
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