The Design of Specialty Clinic Forms

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1997

Abstract:

This project was done to help future optometry students develop the necessary skills and procedures necessary to become a larger part of the primary health care delivery team.

Method:

With the up to date training and most current health care evaluation delivery system developed for ocular care, the following forms and papers were developed with the novice optometry student in mind. These forms and papers were created to be used as a learning tool within the optometry clinic at the Michigan College of Optometry. These forms were created as templates for the students to follow as they examined patients with special ocular conditions. The forms are very basic in that they may go to extremes during the evaluation but are covering all of the comprehensive procedures needed to elicit a complete exam in the particular specialty clinic. All of the procedures cited on the examination forms may not be necessary for each particular exam, the form acts as a template for suggested procedures that may help define a differential diagnosis. While students use this form it is hoped that an imprint on there clinical thinking process will be remembered as to what procedures can or may be done in order to help them with a differential diagnosis. The hope is to teach the students a pattern of thinking that will stick with them during there professional careers.

All of the examination forms were created through research of each topic and by viewing the examining forms of other specialist within each area. After the data and research were gathered the forms were created as a composite of the latest standards of care coupled with the forms of the specialists and latest research data.

Pre-Operative Cataract Evaluation

Name:	Age:	Date:	Last Visit:	Health: E G F P
Meds:			Allergies:	

Risk Factors: ☐ Corticosteroids ☐ Cancer ☐ Diabetes Type I II ☐ Glaucoma ☐ Heart Disease ☐ Vascular Disease ☐ Chronic Uveitis ☐ Other:

Referring Physician: Referral letter ☐ Yes ☐ No

Chief Complaint:

Objective Data

Current Rx:	Add:	DVA s c	PHVA	NVA	Pupils: ☐ ERRL s MG ☐ Other
OD: ____-____ X ____	+____	**OD** 20/	**OD** 20/	**OD** 20/	EOM: ☐ FROM ☐ Other
OS: ____-____ X ____	+____	**OS** 20/	**OS** 20/	**OS** 20/	

Refraction:	DVA	Add:	NVA	K's: ☐ Manual ☐ Automated	Current IOL:
OD: ____-____ X ____	20/	+____	20/	**OD**: @ / @	☐ Yes ☐ No
OS: ____-____ X ____	20/	+____	20/	**OS** @ / @	☐ OD ☐ OS

Biomicroscopy:	**OD**		**OS**	
Lids:	☐ WNL	☐ Other:	☐ WNL	☐ Other:
Lashes:	☐ WNL	☐ Scurf 1 2 3 4	☐ WNL	☐ Scurf 1 2 3 4
Conjunctiva:	☐ Clear	☐ Other:	☐ Clear	☐ Other:
Cornea:	☐ Clear	☐ Gutatta 1 2 3 4	☐ Clear	☐ Gutatta 1 2 3 4
Anterior Chamber:	☐ D & Q	☐ Shallow	☐ D & Q	☐ Shallow
Pupils:	☐ Round	☐ Other:	☐ Round	☐ Other:

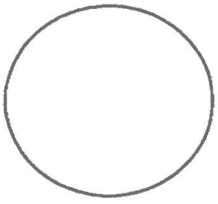
Tonometry @ : a.m. p.m. ☐ Goldmann ☐ NCT ☐ Tonopen **OD**_____ mmHg **OS**_____ mmHg

Diagnostics: 1 gtt OU @ : a.m. p.m. ☐ .5% / 1% Tropicamide ☐ 2.5% Phenylephrine ☐ 1% Cyclopentolate ☐ Paremyd

Type of Cataract:

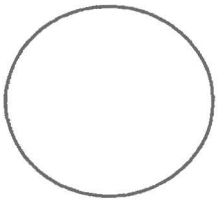
OD

☐ Cortical
☐ Nuclear
☐ PSC
c s Vacuoles
Grade 1 2 3 4
☐ Other:



OS

☐ Cortical
☐ Nuclear
☐ PSC
c s Vacuoles
Grade 1 2 3 4
☐ Other:



Vitreous:

OD		**OS**
☐ Clear		☐ Clear
☐ PVD		☐ PVD
☐ Other		☐ Other

PAM:	VA	Setting (D)
OD:	20/	+/- ____D
OS:	20/	+/- ____D

Fundus: ☐ 78/90D ☐ BIO ☐ Direct ☐ MIO

OD:	**OS:**
C/D:	C/D:
Macula:	Macula:
Vessels:	Vessels:
Periphery:	Periphery:

BAT:	Low	Med.	High
OD:	20/	20/	20/
OS:	20/	20/	20/

A-Scan: Attached ☐ Yes ☐ No

Diagnosis	ICD
1.	1.
2.	2.
3.	3.
4.	4.

Plan	RTC
1.	1.
2.	2.
3.	3.
4.	4.

Post-Operative Cataract Evaluation

Name:	Date of Sx:	Procedure:	Visit #:	Surgery: ☐ **OD** ☐ **OS**
Meds:		Ocular Meds:		
Referring Physician:				Referral letter: ☐ Yes ☐ No
Chief Complaint:				

Objective Data

DVA: s c	PHVA:	NVA: s c	Pupils:	EOM:	K's: ☐ Manual ☐ Automated
OD 20/	**OD** 20/	**OD** 20/	☐ ERRL s MG	☐ FROM	**OD** @ / @
OS 20/	**OS** 20/	**OS** 20/	☐ Other:	☐ Other:	**OS** @ / @

Refraction: ☐ Subjective ☐ Automated	DVA	Add	NVA	Tonometry: @ : a.m. p.m.
OD _____ - _____ X _____	20/	+_____	20/	☐ Goldmann ☐ NCT ☐ Tonopen
OS _____ - _____ X _____	20/	+_____	20/	**OD**_____ mmHg **OS**_____ mmHg

Biomicroscopy:	**OD**			**OS**		
Lids:	☐ WNL	☐ Ptosis 1 2 3 4	☐ Other:	☐ WNL	☐ Ptosis 1 2 3 4	☐ Other:
Conj.:	☐ Clear	☐ Other:		☐ Clear	☐ Other:	
Cornea:	☐ Clear	☐ Gutatta 1 2 3 4	☐ Edema	☐ Clear	☐ Gutatta 1 2 3 4	☐ Edema
AC:	☐ Clear	☐ Cells 1 2 3 4	☐ Flare 1 2 3 4	☐ Clear	☐ Cells 1 2 3 4	☐ Flare 1 2 3 4
Pupils:	☐ Round	☐ Free	☐ Other:	☐ Round	☐ Free	☐ Other:
Lens:	☐ Centered	☐ Dislocated	☐ Synechiae	☐ Centered	☐ Dislocated	☐ Synechiae
PC:	☐ Clear	☐ Cloudy 1 2 3 4		☐ Clear	☐ Cloudy 1 2 3 4	
Wound:	☐ Secure	☐ + Siedel		☐ Secure	☐ + Siedel	

Diagnostics: 1 gtt OU @ : a.m. p.m. ☐ None ☐ 0.5% / 1.0% Tropicamide ☐ 2.5 % Phenylephrine ☐ Paremyd ☐ 1.0% Cyclopentolate ☐ Other:

Fundus: ☐ 78 / 90D ☐ Superfield ☐ BIO ☐ Direct		Vitreous:	
OD:	**OS:**	**OD**	**OS**
C/D:	C/D:	☐ Clear	☐ Clear
Vessels:	Vessels:	☐ PVD	☐ PVD
Macula:	Macula:	☐ Floaters	☐ Floaters
Periphery:	Periphery:	☐ Other:	☐ Other:

Other Tests / Comments / Instructions:

Diagnosis	ICD
1.	1.
2.	2.
3.	3.
4.	4.

Plan

1.

2.

3.

4.

Return to Clinic: ☐ One Day ☐ One Week ☐ Three to six weeks ☐ Two Months

Date: ☐ Three Months ☐ Six Months ☐ Annually ☐ As Scheduled

Pre- and Post Operative Cataract Evaluations

Cataract evaluations are performed on a daily basis within all optometric settings. A cataract is defined as any opacity of the lens, whether it is a small local opacity or a diffuse general loss of transparency. To be clinically significant, however, the cataract must cause a reduction in visual acuity or a functional impairment[i]. This is why so many cataract evaluations are performed daily, to determine if a reduction in visual acuity or a functional impairment exists that may require surgery. Most surgeons will only perform the surgery if the patients visual acuity falls below 20/40 or if a significant reduction in the quality of life exists on the patients part. This is considered an elective surgery and some guidelines by medicare were developed which many surgeons base the need for surgical intervention upon. Most clinicians will track the development of cataracts on a semi-annual or annual basis depending on the development rate of the cataract. There is no way of predicting how fast a cataract will develop, but there are methods to slow the progression. Several studies have shown that populations exposed to greater ultraviolet radiation (UVR) from the sun have a higher incidence of cataract[ii]. It is recommended that persons who have a lot of exposure to the outdoors should wear protective sunglasses and or a wide brimmed hat. It has also been postulated that anti-oxidant supplements may also slow down the progression of cataract formation.

A pre-operative cataract evaluation is designed to evaluate the crystalline lens of the eye and is viewed as a problem specific exam. Most of the time it does not differ too much from a primary care examination except for a few special procedures. These are performed in order to quantify the amount of visual decrease or impairment.

Most practitioners group cataract diagnosis' into one or more of the following types, a cortical cataract, a nuclear sclerotic cataract (NSC) or an anterior/posterior subcapsular cataract (ASC or PSC). A cortical cataract may be seen as spokes with retroillumination as the cortex opacifies. The symptoms may include visual disturbances such as glare and difficulty with night time driving. A nuclear sclerotic (NSC) cataract is seen as a clouding or haze within the center of the lens (the nucleus). The symptoms may include a gradual decrease in the quality of vision or acquired myopia known as second sight. This results in a change in the index of refraction within the lens. An anterior/posterior subcapsular cataract (ASC or PSC) is seen on retroillumination as fine granules at the anterior (front)/ posterior (back) surface of the crystalline lens. A common complaint found with this type of cataract is difficulty while reading due to the location of the cataract along the visual axis. Due to the location of PSC's, they will often affect the patients vision the most because light rays passing through the crystalline lens nodal point is located near the posterior surface. This in turn will cause the patient to become slightly more myopic or less hyperopic[iii]. If vacuoles are seen within the lens, these may be documented. Many other subtypes of cataracts exist and numerous books have been published on the various cataracts that occur, but this paper will describe only a few of the most common types. Some of the other less common cataracts include: metabolic, traumatic, congenital and toxic.

Once a cataract has been identified, it must then be graded on the severity or the degree to which it is developed. A grading system of I-IV is normally used with a I indicating a mild cataract and a four indicating a very opaque, severely developed, clinically significant cataract. The grading of a cortical cataract is based on the observers experience and knowledge with this particular form of cataract. For example, one clinician may grade a cortical opacity as a grade III and another may grade it as a grade II. Other tests help the clinician grade the cataract such as the appearance and the visual deficit. The grading of nuclear sclerotic cataracts is much easier to judge. The grading system is based on the degradation of visual acuity. A grade I will have 20/25-20/30 vision. A grade II will have 20/40-20/60 vision. A grade III will have 20/80-20/100 vision. And finally a grade IV nuclear sclerotic cataract will have acuity from 20/200 on up[iv]. The grading for a posterior or anterior subcapsular cataract is similar to that of a cortical cataract. The grading system is sometimes related to the percentage of the crystalline lens obstructed by the opacity. For example, a PSC that obstructs 50% of the lens may be graded as a II. If 75% is obstructed it may be graded as a III.

The examination begins with the patient's medical and ocular histories. Things such as patient name, date, age, and last eye examination are documented. Any previous implant surgery should be noted for the appropriate eye. Some other valuable information such as systemic and ocular medications along with any pharmacological allergies are noted since these will be an important consideration for surgery.

Once this information has been elicited, some risk factors related to cataract formation and complications for surgery are found. Some of the more common ocular risk factors related to cataract development include corticosteroid use, chronic uveitis, trauma, diabetes and high exposure to sunlight. Some of the systemic risk factors related to the surgery include cancer, heart disease and vascular disease. A newly identified risk factor is the body mass index or BMI. This is a person's weight in kilograms divided by the square of the person's height in meters. It was found that men with a BMI of 27.8 or greater had slightly more than double the relative risk of cataract than men with a BMI of less than 22[v]. This is just a short list of some of the risk factors related to cataract development and surgical intervention. Many others may be elicited during the case history.

The patients visual acuity at distance, pinhole acuity at distance and near is done to begin the objective data collection. The current prescription should be worn and a lensometer should be used to confirm the correct prescription .

The pupils and extraocular muscles are evaluated next. Any abnormalities should be noted as well as any ptosis or dermatochalasis for future reference post operatively.

Keratometry prior to surgery should be performed in order to determine if any astigmatism is induced from sutures or healing scar tissue post operatively. The type of keratometer used is documented (i.e. manual or automated).

The next procedure performed is the refraction. With certain types of cataracts a refraction may restore the patients vision to acceptable levels for a short time, but the problem of glare and decreased contrast sensitivity will return. Just how long this new prescription will remain acceptable depends upon how fast the cataract is progressing. Distance acuity and near acuity are recorded.

Biomicroscopy should be performed following the refraction. The main area's to pay special attention to are the lids, cornea, anterior chamber and the pupil shape. Also make a note of any scurf located on the lids or lashes that could cause a potential ocular infection following cataract extraction. Assessing the anterior chamber includes a close look for any inflammatory signs and to determine the depth of the chamber. The angles can also be assessed at this time. Looking at the pupil make sure to note the shape and if any defects of the iris are present such as transillumination. A quick assessment of the crystalline lens may be performed at this time but a much better evaluation can be done post dilation.

The intraocular pressures may be evaluated following the slitlamp examination. The type of tonometer used, the time of day and the pressure of each eye is recorded.

Next choose the appropriate mydriatic agent. This is done by using the pertinent systemic history and the slitlamp evaluation. The amount, percentage, time of day, and which eye the drops were instilled in needs to be recorded. The mydriatics will require approximately thirty minutes to take full effect.

Once the patient is dilated the slitlamp can be used to determine the size and extent of the cataract. The type of cataract and grade of the cataract is recorded. A drawing of the cataract should also be made.

The vitreous is then evaluated using fundoscopy. It begins at the posterior lens capsule and extends to the retina. Normally the vitreous is clear in younger individuals but in the mature adult collagen fibrils may be seen[vi]. The remainder of the vitreous is optically empty. This will allow for an un-obstructed view of the retina.

If cells are noted in the vitreous, the next step is to identify what type of cells. If an inflammatory condition is occurring within the retina or the vitreous body, then white blood cells (leukocytes) may be seen. If the cells are reddish-brown then it is most likely blood. This could be a sign of a retinal detachment or some other condition causing a broken blood vessel in the retina to leak. Evaluate if any new blood vessel have grown into the vitreous. If the cells in the vitreous are a whitish-brown this could indicate a detachment. Any sudden increase in the number of pigment cells noted by the patient or doctor should be viewed suspiciously and the cause determined.

Another condition that may be seen within the vitreous occurs when the gel turns into fluid filled spaces called lacunae. This condition may cause a posterior vitreous detachment. A PVD may occur spontaneously in people over the age of 40[vii]. Frequently a PVD will remove a small ring of peripapillary tissue and becomes visible just above the optic nerve head. This is a Weiss ring.

Still performing fundoscopy, an evaluation of the optic disc is performed. Each disc is displaced slightly nasal as they enter the eye. While examining the optic disc, the cup to disc ratio (C/D) is determined. The C/D is recorded in horizontal and vertical meridians. A recent study found that 84% of the population has C/D ratio's of less than 0.74 horizontally and 0.64 vertically[viii]. The rim tissue is also evaluated. The rim tissue has a slightly pinkish hue to it and it is be fairly circular to slightly oval. Pallor or paleness in any part of the optic disc is noted and evaluated further. If any notching of the inferior or superior rim is observed, it may indicate signs of glaucomatous damage. The blood vessels should rest upon the rim tissue and should not be suspended in the optic cup. The caliber of the vessels is noted as well as the size of the reflex from the

light source off of the vessels. Hemorrhages near the disc could point to PVD's, systemic hypertensive retinopathy, diabetes, leukemia or glaucoma[ix]. The nerve head should be flat and not swollen which suggests papilledema or disc edema. With these conditions the margins of the optic nerve head will appear blurred or indistinct. If the condition is severe enough retinal folds may be seen near or around the optic nerve head[x]. As a final check always compare the appearance of the two nerve heads with each other and note any differences. Ninety-nine percent of the time the two optic nerve heads will appear alike.

The macular region is viewed following optic disc evaluation. The macula is located 2 disc diameters temporal and ½ disc diameter inferior to the optic nerve head. It is 5mm in diameter. Any decrease in a person's vision should alert the clinician to carefully investigate the macula. While viewing the macula with a light, a small bright spot of light is observed centrally, the fovea. If the reflex of light off of the fovea is not visualized it may be a clue that the macular area is not flat and may have macular edema, a macular hole or fibrosis. Among the conditions that cause macular edema are diabetic macular edema and central serous choroidopathy. Also common to older individuals is mottling of the macular pigment. The macular area will appear roughened with spots of darker pigmentation scattered around the fovea. Another common finding in the mature population is drusen. This is believed to be lipofuscin deposits found between the retinal pigmented epithelium and Bruch's membrane. This is thought to be one of the earliest signs of age related macular degeneration. If there is a disease process found in the macular area, this is a contraindication for cataract surgery, since replacing the crystalline lens with an IOL will not increase the patients acuity. The only time the lens is extracted and replaced is when a clear view of the fundus is needed to evaluate and treat other conditions such as diabetic retinopathy.

The extending vasculature needs to be evaluated. At the first bifurcation the arterioles should be approximately 2/3 the thickness of the venuoles. The venuoles appear slightly darker. If the arterioles appear quite small, it may indicate hypertension. The path of the vasculature is evaluated. It should arc around the macular area into a superior and inferior vascular arcade. If they appear very twisty or tortuous, this could indicate a systemic vasculature problem. If a hemorrhage is seen it must be determined if a sub-retinal neovascular net is present. This is differentially diagnosed using fluoroscien angiography. If a hemorrhage is found it must be determined what the shape is and in what layer of the retina the blood is leaking, as well as the reason[xi]. Some of the most common causes of hemorrhages include proliferative and non-proliferative diabetic retinopathy, hypertensive retinopathy, central retinal vein or artery occlusions, and blood dyscrasia's.

Another finding related to the vasculature is cotton wool spots. These are local infarcts within the nerve fiber layer. They appear as white fluffy cotton balls seen in the retina that obscure underlying structures. These may be seen in diabetics, hypertensives or in HIV/AIDS patients.

The retinal periphery is evaluated last. The periphery should be flat and appear reddish in color. Less retinal vasculature will be seen in the periphery, but venous ampullae in the choroidal layer will be seen. They will appear at approximately the 1, 5, 7, and 11 o'clock positions. Another commonly seen landmark is the dark brown to

black ora serrata. This is where the sensory retina ends. Any hole or tear in the retina will show up as a bright red area that is easily distinguished from the surrounding retina. If a hole is noted in the periphery, then scleral indentation must be performed to rule out any fluid cuffs or detached sensory retina. If there is a chance of further detachment, then prophylactic laser surgery may be necessary.

Once all of the following procedures are completed the exam is not complete. Other tests designed to help determine the effects of the cataract on acuity and daily functions are performed.

The brightness acuity test (BAT) is done to determine how much the patient is affected by bright light and glare. This test uses the scattering effect of light caused by a cataract. The BAT has a low, medium and high setting. It is done while the patient is dilated and using their current prescription. While the patient looks through the BAT the light source is turned on and the acuity is measured at each setting. These results can help to determine the grade and future measurements to be compared for further development.

The potential acuity meter (PAM) is another device that is used to determine the grade of the cataract as well as determine what the possible outcome of surgery will have on acuity. The PAM projects a visual acuity chart through an opening in the cataract onto the retina of a patient while they are dilated. The chart is projected around the cataract using a laser generated chart. This test can determine if the retina is in good working order, but an experienced clinician needs to be aware of false positives and negatives. A healthy retina will notice an increase in acuity while using the PAM. The acuity obtained is a measure of the potential outcome on vision that cataract surgery will have on the patient's vision.

A final test that will be performed is an A-Scan. This measures the length of the eyeball in millimeters from the front surface of the cornea to the retina. Once the length has been determined and the patient's post surgical prescription estimate is determined along with keratometry readings, this data can be entered into the A-Scan to decide what power of the intraocular lens implant. Five calculations are performed and the average is determined. This is how the AC- IOL and PC-IOL are determined. The patient's cornea is anesthetized and the A-Scan probe is placed directly on the cornea. The necessary data is then plugged into the A-Scan and the calculations are computed. A copy of the A-Scan results should be permanently attached to the patients record.

The next step involves a decision by the patient and the O.D or surgeon. This determines if the patient is going to pursue to have surgery now or take a "wait and see attitude". Selecting a surgeon is done with the combined efforts of the doctor and patient. If the surgeon feels cataract surgery would be beneficial, the patient will be temporarily referred to the surgeon's care until after the surgery.

This is a basic view of what encompasses a pre-operative cataract evaluation and is by no means conclusive. The patient will then be sent back to the referring doctor for post-operative cataract care.

Dependent upon the outcome and complications if any, the patient may be seen as soon as one day after surgery. If some complications were encountered during the procedure, then the surgeon may wish to keep a close watch on the patient and will not refer the patient for post-operative care. When the resolution of the problem occurs or

he/she is confident the problem is resolving they will refer. The normal follow up schedule is one day, one week, two months, six months and annually or as needed.

As with any patient a brief history is taken initially the following day after cataract surgery. This includes the patient's name, date of the surgery, procedure performed (i.e. ECCE, ICCE, etc.), which visit (i.e. one, two, etc.), which eye had the surgery, any systemic as well as ocular medications, and the chief complaint. This may include mild bruising around the orbit including sub-conjuntival hemorrhages, mild ocular discomfort or blurred vision.

The examination starts with the acuity. They should be taken with and without the patient's current prescription at distance, pinhole acuity at distance and near.

The pupils are checked along with extraocular muscle function following acuity. Any abnormalities found between the pre-operative and post-operative examination are documented.

Keratometry readings are taken next. The type of keratometer used during the pre-operative exam should be used for the post-operative examination. These readings are compared to readings taken pre-operatively to find how much astigmatism or cylinder was induced by the surgery.

During the second post-op visit, depending upon the type of wound closure and the type of sutures used, some of the induced cylinder may be reduced by removing a suture 90 degrees away from the minus cylinder axis if the surgeon used interrupted sutures[xii]. This will decrease the amount of induced cylinder during the healing process. Another method to reduce this cylinder without removing the sutures is to use a steroid drop.

The next objective / subjective test is the refraction. This may be an automated procedure done while automated keratometry readings were taken. If not then a manual refraction is performed. The add determination for near should also be found since the patient has no focusing power in an aphakic eye. If only one eye has had cataract extraction and an IOL has been placed in the eye, the clinician must be aware of any anisometropia it may induce. If the situation warrants, a contact lens prescription may be necessary if an IOL is not implanted in the eye. This will decrease the difference in image sizes on the retina and may even be more comfortable for the patient's vision. Once the patient's refraction stabilizes and is consistent on two consecutive visits a new prescription may be given to the patient to fill as long as no other contraindications are present this occurs between the third to sixth week.

The next step is to make a slitlamp evaluation. The eyelids are looked at for any induced ptosis or ecchymosis. The conjunctiva is evaluated for any hemorrhages of chemosis as well as the healing of the wound site. The cornea is evaluated for any edema and the endothelium viewed for signs of damage or change. The anterior chamber will have cellular debris as well as possible minute particles of the lens throughout. Careful attention is needed in this area to differentiate this debris from any inflammatory sign such as cells and flare. Also look for signs of a hyphema. A quick check of the iris is in order to look for transillumination. The IOL is looked at to make sure it is in its proper position and the haptics appear to be in place. The lens should appear clear and without any posterior synechiae. The posterior chamber is normally clear and if not the degree of cloudiness from minute lens particles or inflammation noted. If ECCE was performed

on the patient the posterior capsule of the lens capsule should be evaluated for the formation of a secondary cataract known better as a secondary membrane. This condition can be treated approximately three to six weeks post-operatively by a Yag capsulotomy. The procedure is relatively simple and non-invasive. It is performed in nearly 50% of all posterior chamber intraocular lens implants within two years following the surgery. The patient will usually complain of a film or a decrease in vision over time. The wound site is evaluated to make sure that the wound is not leaking or any tissue is not prolapsing through this site. The suture should not be exposed and the knots buried under the conjunctiva. If a suture barb is exposed it can cause the patient irritation and should be trimmed. The Siedel test for wound leaks can be performed during the next procedure, tonometry.

The wound site is evaluated for leakage using fluorescien drops that are used during tonometry. If not, then a strip containing fluorescien can be instilled into the operated eye.

One day post-operative, tonometry is then performed and the type of tonometer used and the time of day is recorded. These finding need to be compare to the pre-operative finding to rule out any post-operative rise in intraocular pressure within the operated eye. If the pressure has risen significantly a reason for this must be found and treatment is initiated immediately. Some causes may include debris in the angle or pupillary block from the PC- IOL. Approximately one to two weeks post-operatively , considering any contraindications, the proper mydriatic agent is chosen and instilled in each eye. The mydriatic used, amount instilled and time of day are documented.

Approximately thirty minutes following instillation of the mydriatic agent(s), a slitlamp evaluation of the lens may be performed. The position and clarity of the IOL are noted along with any abnormalities found such as a haptic outside of the lens capsule. A careful observation of the posterior capsule should reveal it as intact without any holes or vitreous prolapsing through it. Look for any signs of a secondary membrane.

The vitreous and optic disc are evaluated as mentioned above in the pre-operative procedure.

The macular region is assessed following the above evaluation. A particular entity to be aware of following cataract extraction is post-operative cystoid macular edema. The patient will usually present weeks after the surgery with an unexplained decrease in vision. The clinician needs to look at this area and to find the foveal reflex. Mild macular edema may not be observable except upon fluorescien angiography. A specific pattern will develop on angiography called the flower petal pattern. It is pathopneumonic of this type of macular edema.

The remaining retinal vasculature and retinal periphery are evaluated as previously described. Particular detail to the peripheral retina is warranted. A common late post-operative complication that may be found is a choroidal or retinal detachment. The risk of these conditions occurring rises when other factor such as high myopia or retinal lesions like lattice degeneration are present pre-operatively. Any complications incurred during the surgery such as vitreous loss may also increase the chances of a detachment.

Based on the findings of the post-operative examination each time, a new visit is scheduled for the patient using the results. If serious complications are found during the

co-management of the patient, these findings are shared with the surgeon and the patient may need to return to the surgeon.

This is not a comprehensive pre- and post-operative examination protocol, but is meant to be used as a template for these examinations. Each patient is unique and a specific examination may need to be created for each patient based on the exam findings.

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[xi] Dufek, MA. The Differential Diagnosis of Retinal Bleeding. *Review of Optometry*, February 1996.

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Extended Ophthalmoscopy

Name:	Age:	Date:	Last Visit:	Health: E G F P
Meds:	Allergies:	POH:		
Referring Physician:			Referral letter: ☐ Yes ☐ No	
Chief Complaint:				

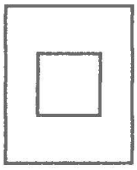
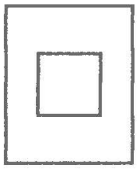
Objective Data

DVA s c: **OD** 20/ **OS** 20/	NVA: **OD** 20/ **OS** 20/	SLE: AC <: **OD**_____ **OS**_____

Tonometry @ : a.m. p.m. ☐ Goldmann ☐ NCT ☐ Tonopen **OD**_____ mmHg **OS**_____ mmHg

Mydriatic: 1 gtt @ : a.m. p.m. ☐ .5% / 1% Tropicamide ☐ 2.5% Phenylephrine ☐ Other :

Amsler Grid:
☐ Yes
☐ No
☐ WNL
☐ Other:

OD  **OS** 

Photostress Recovery Test:
OD Seconds 20/
OS Seconds 20/

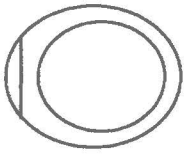
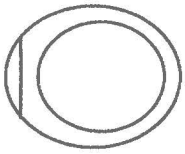
Fundus Photo's: ☐ Yes ☐ No

Visual Fields: ☐ Yes ☐ No
☐ Attached
☐ Dicon
☐ Humphrey
Last Field: / /

Fundus Exam: ☐ 78/90D ☐ Superfield ☐ BIO ☐ Contact Lens, Type :

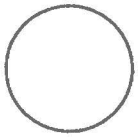
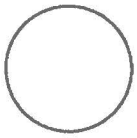
Vitreous:

OD	**OS**
☐ Clear	☐ Clear
☐ PVD	☐ PVD
☐ Floaters	☐ Floaters
☐ Blood	☐ Blood
☐ Other:	☐ Other:

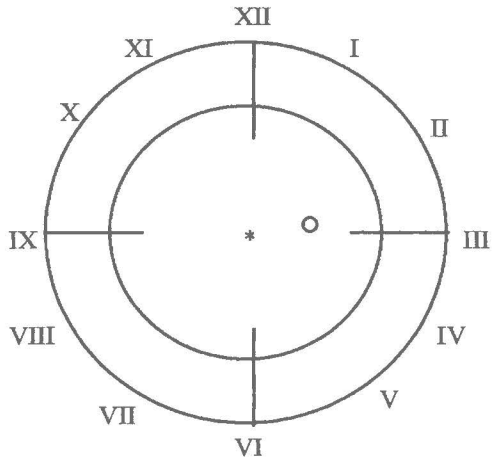
Optic Disc:

OD	**OS**
Horiz:	Horiz:
Vert:	Vert:
Rim:	Rim:
Depth:	Depth
Vessels:	Vessels:

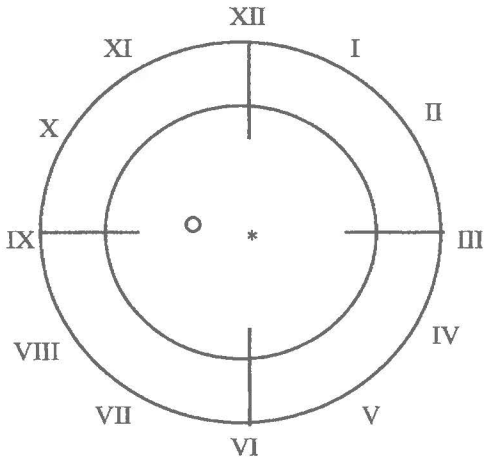
 

Retina:

OD



OS



Diagnosis	**ICD**
1.	1.
2.	2.
3.	3.
4.	4.

Plan	**RTC**
1.	1.
2.	2.
3.	3.
4.	4.

Extended Ophthalmoscopy

Extended ophthalmoscopy is a procedure that is reserved for abnormal presentations found within the fundus. This is why the term extended is used to define this procedure, it is assumed that the patient has had a complete eye exam recently in which abnormal findings were found. Normally it is performed by a retinal specialist be it an Optometrist or Ophthalmologist. It is used on a referral basis or as a second opinion that warrants further evaluation. It is done to answer the question "what is it?" and to place a differential diagnosis on the condition. This allows the doctor to prepare a treatment plan and it informs the patient of what can be expected in the future.

The exam should start with some of the basic skills of history documentation. This includes name, age, date, last visit to an eye care provider, general health condition, medications, allergies and previous ocular history. The previous ocular history usually entails the reason for the patients visit.

A patient is dilated while this procedure is done. This allows the examining doctor a better view of the peripheral fundus. After a brief check of the anterior segment with a slit lamp and tonometry findings, the appropriate mydriatics are chosen for the dilation. At times the patient may be asked to perform a visual field test prior to dilation or post-dilation.

Visual fields are another way of determining what effect the abnormality has on the posterior pole of the retina. A visual field can determine the size and depth of a defect within the retinal layers. This will be a permanent record of the defect and can be used at future evaluations to see if the retinal defect is enlarging or increasing the depth of the defect. The visual field is also used to determine if damage has or is occurring to the nerve fibers in the retina or optic nerve head.

The most common instruments used today for extended ophthalmoscopy are fundoscopy with a contact lens and a binocular indirect ophthalmoscope. Each specialist has his/her own preference for which selection of lenses to use depending upon what type of magnification and what size field of view they require.

One frequently overlooked aspect in retinal drawings is the use of color coded pencils to accurately create a realistic picture of the observation. The following suggestions are commonly used. Red is commonly used for arteriole vasculature and the normal retina. Black for a nevus, the outline of detached retina or RPE hypertrophy. Green for anything found within the vitreous. Blue for the retinal veins, lattice or the outline of neovascularization within the retina. Brown to represent any pigment in the retina. Yellow to represent RPE defects or drusen. The point is that an experienced clinician will have a key of color codes that he/she will follow and that others may use.

The exam will begin with evaluation of the vitreous body. This is the gel like fluid that is contained within the eye. It begins at the posterior lens capsule and extends to the retina. The vitreous is clear in younger individuals but in the mature adult collagen fibrils may be seen[i]. The remainder of the vitreous is optically empty. This will allow for an un-obstructed view of the retina.

If cells are noted in the vitreous, the next step is to identify what type of cells. If an inflammatory condition is occurring within the retina or the vitreous body, then white blood cells (leukocytes) may be seen. If the cells are reddish-brown then it is most likely blood. This is a sign that a retinal detachment may have occurred or some other condition causing a broken blood vessel in the retina to leak. Evaluate if any new blood vessels have grown into the vitreous. If the cells in the vitreous are a whitish-brown this could indicate a detachment. Any sudden increase in the number of pigment cells noted by the patient or doctor should be viewed suspiciously and the cause determined. Obviously further evaluation to the cause of cells in the vitreous should be investigated.

Another condition that may be seen within the vitreous occurs when the gel turns into fluid filled spaces called lacunae. This condition may cause a posterior vitreous detachment. A PVD may occur spontaneously in people over the age of 40[ii]. Frequently a PVD will remove a small ring of peripapillary tissue and becomes visible just above the optic nerve head. This is a Weiss ring.

Next the optic discs are looked at to determine the health of the optic nerve and blood vessels as they enter the eye. Each disc is displaced slightly nasal as they enter the eye. While examining the optic disc, the cup to disc ratio (C/D) may be determined. The C/D is recorded in horizontal and vertical meridians. A recent study found that 84% of the population has C/D ratio's of less than 0.74 horizontally and 0.64 vertically[iii]. The depth of the cupping within the optic disc evaluated in diopters using a direct ophthalmoscope. The rim tissue is also evaluated. The rim tissue has a slightly pinkish hue to it and is fairly circular to slightly oval. Pallor or paleness in any part of the optic disc is noted and evaluated further. If notching of the inferior or superior rim is observed it may be indicative of glaucomatous damage. The blood vessels should rest upon the rim tissue and should not be suspended in the optic cup. The caliber of the vessels is noted as well as the size of the reflex from the light source off of the vessels. Hemorrhages near the disc could point to PVD's, systemic hypertensive retinopathy, diabetes, leukemia or glaucoma[iv]. The nerve head should be flat and not swollen which suggests papilledema or disc edema. With these conditions the margins of the optic nerve head will appear blurred or indistinct. If the condition is severe enough retinal folds may be seen near or around the optic nerve head[v]. As a final check always compare the appearance of the two nerve heads with each other and note any differences. Ninety-nine percent of the time the two optic nerve heads will appear alike.

The final data gathered will be that found within the macular area, nerve fiber layer, extending vasculature, and retinal periphery. The entire retina should appear flat and should have a consistent reddish hue. Consideration of the patients ethnic background must also be accounted for in the color of the fundus. The more pigmentation in the patients skin, the darker the appearance of the fundus. Any deviation from this appearance warrants further evaluation.

The macula is located 2 disc diameters temporal and ½ disc diameter inferior to the optic nerve head. It is 5mm in diameter. Any decrease in a person's vision should alert the clinician to carefully investigate the macula. While viewing the macula with a light, a small bright spot of light is observed centrally, the fovea. If the reflex of light off of the fovea is not visualized it may be a clue that the macular area is not flat and may have macular edema, a macular hole or fibrosis. Among the conditions that cause

macular edema are diabetic macular edema and central serous choroidopathy. Also common to older individuals is mottling of the macular pigment. The macular area will appear roughened with spots of darker pigmentation scattered around the fovea. Another common finding in the mature population is drusen. These are lipofuscin deposits found between the retinal pigmented epithelium and Bruch's membrane. This is one of the earliest signs of age related macular degeneration.

The nerve fiber layer is viewed while examining the macular area. There is also a bundle of fibers that goes directly from the macula to the optic nerve head. This bundle is the papullo-macular bundle. The fibers appear as striations on the surface of the retina and many times are difficult to see. A common finding in the nerve fiber layer is medulated nerve fibers. They will appear as feathery white striation heading towards the optic nerve head. The borders will be indistinct and nothing below the fibers is visible. Using the cobalt filter on a slit lamp with the condensing lens, experienced clinicians may be able to pick up early signs of glaucoma. They will appear as striations with a defect such as a slit or wedge missing within the striations. This is one of the earliest signs of glaucoma.

The extending vasculature needs to be evaluated. At the first bifurcation the arterioles should be approximately 2/3 the thickness of the venuoles. The venuoles appear slightly darker. If the arterioles appear quite small, it may indicate hypertension. The path of the vasculature is evaluated. It should arc around the macular area into a superior and inferior vascular arcade. If they appear very twisty or tortuous, this could indicate a systemic vasculature problem. If a hemorrhage is seen it must be determined if a sub-retinal neovascular net is present. This is differentially diagnosed using fluoroscien angiography. If a hemorrhage is found it must be determined what the shape is and in what layer of the retina the blood is leaking, as well as the reason[vi]. Some of the most common causes of hemorrhages include proliferative and non-proliferative diabetic retinopathy, hypertensive retinopathy, central retinal vein or artery occlusions, and blood dyscrasia's.

Another finding related to the vasculature is cotton wool spots. These are local infarcts within the nerve fiber layer. They appear as white fluffy cotton balls seen in the retina that obscure underlying structures. These may be seen in diabetics, hypertensive or in HIV/AIDS patients.

The retinal periphery is evaluated last. The periphery should be flat and appear reddish in color. Less retinal vasculature will be seen in the periphery, but venous ampullae in the choroidal layer will be seen. They will appear at approximately the 1, 5, 7, and 11 o'clock positions. Another commonly seen landmark is the dark brown to black ora serrata. Any hole or tear in the retina will show up as a bright red area that is easily distinguished from the surrounding retina. If a hole is noted in the periphery, then scleral indentation must be performed to rule out any fluid cuffs or detached sensory retina. If there is a chance of further detachment then prophylactic laser surgery may be necessary. Some other common findings are hyperpigmented spots and nevi found in the peripheral retina. One must be careful to note the size and location of any possible nevi to make sure they are not increasing in size over time. One must be careful not to mistake a nevus for a sub-retinal neovascular net. This can be differentially diagnosed using a red free filter or fluoroscien angiography.

This is just a general view of how to perform an extended fundus exam and is by no means conclusive. Some of the more common findings and conditions have been pointed out. Along with these suggestions it may be beneficial to perform other tests such as fluorescein angiography, EOG, ERG, Amslers Grid, B-Scan, and Fundus or Disc photo's. These can be performed to arrive at a differential diagnosis.

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[i] Fingeret M, Casser L, Woodcome HT. *Atlas of Primary Eyecare Procedures;* Appleton & Lange, Norwalk, Conn.; *1990.*

[ii] Walling, PE. *Disorders of the Vitreous and Peripheral Retina.* Michigan College of Optometry; 1995.

[iii] Lingle, NJ. What to Do When You Suspect Glaucoma. *Review of Optometry*, September 1995.

[iv] Prouty, R. Understanding Optic Nerve Damage. *Review of Optometry*, September 1996.

[v] Kanski, JJ. Clinical Ophthalmology 2nd Edition; Butterworth-Heinemann Ltd., Oxford,U.K.; 1993.

[vi] Dufek, MA. The Differential Diagnosis of Retinal Bleeding. *Review of Optometry*, February 1996.

Glaucoma Evaluation

Name:	D.O.B.:	Age:	Date:	Race:
Meds:	PMHx:			
FOHx:	POHx: Surgery ☐ Yes ☐ No			
Referring Physician:			Referral letter: ☐ Yes ☐ No	
Chief Complaint:				

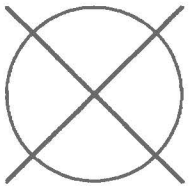
Risk Factors: ☐ FOHx ☐ Age ☐ Race ☐ Gender ☐ Chronic Uveitis ☐ Ocular Trauma ☐ Corticosteroids ☐ IOP ☐ C/D's ☐ Pigmentary Disp. Synd. ☐ Exfoliation Synd. ☐ High BP ☐ Ant. Chamber Angles ☐ Other:

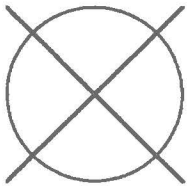
Objective Data

DVA c s: **OD** 20/ **OS** 20/	PHVA: **OD** 20/ **OS** 20/	Pupils: ☐ ERRL s MG ☐ Other:

Tonometry:	@ : a.m. p.m.	@ : a.m. p.m.	Diagnostics: 1 gtt OU @ : a.m. p.m.
☐ Goldmann	**OD**_____ mmHg	**OD**_____ mmHg	☐ .5% / 1% Tropicamide ☐ None
☐ NCT	**OS**_____ mmHg	**OS**_____ mmHg	☐ 2.5% Phenylephrine ☐ Paremyd
☐ Tonopen	☐ Pre-Dilation	☐ Post-Dilation	

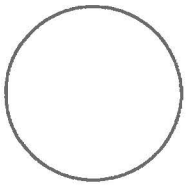
Gonioscopy: ☐ 3-Mirror ☐ 4-Mirror ☐ None

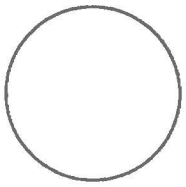




Optic Disc: ☐ 78/90D ☐ Superfield ☐ Contact Lens

C/D: **OD**	C/D: **OS**
Horiz.:	Horiz.:
Vert.:	Vert.:
Rim:	Rim:
Depth:	Depth:
Vessels:	Vessels:





Fundus: ☐ BIO ☐ Direct ☐ Contact Lens		Vitreous:		Visual Fields: ☐ Yes
OD	**OS**	**OD**	**OS**	Date: ☐ No
Macula:	Macula:	☐ Clear	☐ Clear	☐ Humphrey
NFL:	NFL:	☐ PVD	☐ PVD	☐ Dicon
Periphery:	Periphery:	☐ Floaters	☐ Floaters	☐ Tangent Screen
		☐ Other:	☐ Other:	Photo's: ☐ Yes ☐ No

Other Tests / Comments / Instructions:

Diagnosis	ICD
1.	1.
2.	2.
3.	3.
4.	4.
Plan	**RTC**
1.	1.
2.	2.
3.	3.
4.	4.

Return to Clinic: ☐ Referral to Dr.

IOP Tracking Form

Name:	DOB:	Allergies:	DDX:

Pressure: **KEY**: X = OD ; O = OS *Tonometry: G = Goldmann ; NCT = Non-Contact ; T = Tonopen

Pressure																
30+																
30																
29																
28																
27																
26																
25																
24																
23																
22																
21																
20																
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12																
11																
10																
09																
08																
Date:																
Time:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Tap: *																
C/D's: OD OS																
Ocular Meds.																
Last VF																

GLAUCOMA

This paper is an overview of some of the signs and symptoms to look for while evaluating a patient for glaucoma. Glaucoma is defined as to much pressure within each individuals eye that may cause damage to the optic nerve. Normal pressure for most of the population ranges between 10-21 mmHg. Three major aspects of the visual exam need to be specifically evaluated to determine if the patient has the signs of glaucoma. The patients intraocular pressure, C/D ratio, and a sequential record of at least two visual fields is needed to determine if the patient has a true diagnosis of glaucoma. Some signs of this disease can be an injected eye, ocular pain that is usually a dull ache or halo's around lights. Once the signs and symptoms are conclusive, the next question is when to treat the condition and with what type of medication or surgery.

Three theories exist on the causative mechanism of glaucoma[1]. The first is the mechanical theory. This theory states that the damage to the optic nerve axons occurs within the lamina cribrosa. This is the tissue plate at the bottom of the optic cup where the nerve axon ganglions exit the eye. It is thought that the increased ocular pressure causes the fibers to become pressed against the holes in the cribriform plate from an inside out push. The second theory is the vascular theory. It is believed that the increased intraocular pressure causes the vascular profusion to the optic nerve head to become compromised. This causes decreased blood flow and damage to the ganglion axons as well as the nerve head. The third theory is a combination of the first and second theory. It states that the damage is caused by a mixed mechanism.

With this in mind let's consider some of the four main types or categories of glaucoma: primary open angle glaucoma (POAG), acute chronic glaucoma (ACG), secondary glaucoma and low or normal tension glaucoma (LTG). The most common type of glaucoma is primary open angle glaucoma (POAG). This glaucoma is characterized by normal and open anterior chamber angles. The second major type of glaucoma is acute closure glaucoma (ACG). With this glaucoma the intraocular pressure rise is caused by a blockage of aqueous outflow through the trabecular meshwork. The patients normally have narrow anterior chamber angles. The third type of glaucoma is termed secondary glaucoma. There are a variety of conditions that can lead to a rise in intraocular pressure such as trauma, medications, systemic diseases, or abnormalities in the eye that are indirectly responsible for the rise in IOP. The final category of glaucoma is called low or normal tension glaucoma (LTG). This glaucoma shows no abnormal rise in intraocular pressure but the patient shows an increase in the C/D ratio's and characteristic visual field changes. A controversial form of glaucoma is termed ocular hypertension. This form is not a true glaucoma and falls in a gray area. With this form of glaucoma, all examination findings including visual fields are normal except the patient displays higher than normal intraocular pressures.

Within POAG, ACG and the secondary glaucoma's are several sub-types of each category. A great reference to these conditions can be found in many texts.

Examining a patient that is suspected of having glaucoma, the basic skills of history taking need to be applied. This includes name, DOB, age, date, and race. Normally, race is not a question that is asked, but with diagnosing glaucoma, studies

have shown that African American individuals have a 4-5X more frequency of being diagnosed with glaucoma[ii]. Some other pertinent information includes the family ocular history, current medical conditions and medications, as well as ocular medication, previous ocular conditions and the chief complaint. This information will give an experienced clinician some very important background information to work with.

Additional information can come from a series of quick questions that identify potential risk factors for the patient in question. A few of these risk factors have been mentioned above and include family ocular history and age. Another risk factor that can be related to glaucoma includes the patients gender, male or female. This question is usually not a consideration but it was found that with ACG females are more commonly affected than men by a ratio of nearly four to one[iii]. Other specific systemic conditions such diabetes, hypertension and hypothyroidism are considered risk factors. Recent studies have shown an association between hypothyroidism and POAG[iv] A specific medication to be aware of is corticosteroid use. Besides being implemented in the development of posterior subcapsular cataracts, some individuals respond to steroids by having a rise in intraocular pressure. Some ocular conditions to be aware of that should signal a red flag include chronic uveitis, which can inflame the trabecular meshwork or block it with inflammatory cells. Ocular trauma may damage the anterior chamber angle affecting aqueous outflow. Pigmentary dispersion syndrome can impede the outflow and exfoliation syndrome may impede the outflow with lens debris. The obvious ocular risk factors are increased IOP's, large C/D's and narrow anterior chamber angles. This is a short list of the potential risk factors that need consideration when evaluating a patient for glaucoma.

The first step of any objective examination is obtaining visual acuity. A check of the pupillary responses is done as well. A quick refraction can be done to see if any improvement in the visual acuity is found.

Biomicroscopy of the anterior chamber depth and estimation of the anterior chamber angles is performed. Next an intraocular pressure reading is done. The type of tonometer and the time of day must always be documented. The time of day is important because intraocular pressure is always highest in the morning. The type of tonometer used is also important because the readings should be done on the same type each time if possible due to slight variances in the instruments, mode of use and patient apprehension. If the patient appears to have narrow angles and is a hyperope then post dilation pressures will need to be taken.

It would be a good idea to create a quick reference sheet that tracks a suspected glaucoma patient's intraocular pressures. It can also be used to track the efficacy of medications over time to see if long term drift is occurring and if the medication is reaching targeted pressures. This form can be created in a graph format to include the date, the time, type of tonometer used, current C/D ratio's, current pharmaceutical agents being used and the date of the last visual field. This form eliminates the need to review previous exam records and graphs out the intraocular pressures over time.

The next procedure to perform on any glaucoma suspect is gonioscopy. It is done prior to the instillation of any mydriatic agents. This will allow for a full view of the anterior chamber angle without bunching up of the iris towards the angle blocking the clinicians view of the angle structures. This will allow the clinician to observe how

narrow the angle truly is and if a mydriatic agent can be used safely. This procedure allows the clinician to define the amount of pigment or cellular debris blocking the angle. Before the gonio prism is used upon the patients eye a drop of topical anesthetic is instilled on the ocular surface. This minimizes reflex blinking. Once the angles are seen, the practitioner must document the structures viewed and the amount of pigment seen in the angle. Any abnormal findings such as very narrow angles, debris in the angle, peripheral anterior synechiae, neovascularization, excessive pigment or angle recession as the result of trauma are recorded.

From the anterior aspect to the posterior aspect, the angle structures viewed are: line of Schwalbe, trabecular meshwork, scleral spur and the ciliary body. The line of Schwalbe is white. The trabecular meshwork is divided into the anterior (brownish) and the posterior (grayish). The scleral spur is also a prominent white line. Finally the ciliary body is brown to black in coloration. Once the structures seen are identified a numerical classification from one to four can be given to the angle. A grade IV angle means the ciliary body and structures anterior to it are visible. If the scleral spur and structures anterior are visible, this corresponds to a grade III angle. A grade II would include the trabecular meshwork and any structures anterior. When a grade II angle is observed it is often accompanied by a number such as II-50 meaning that 50% of the trabecular meshwork is visible. A grade I includes the line of Schwalbe anterior[v].

Along with the grading of the angle, the amount of pigment within the angle needs to be documented. A pigment grading scale of one to four exists where one is little pigment and four is the maximum amount of pigment. This is important since the more pigment found in the angle, the greater the chance that it will impede the outflow through the trabecular meshwork.

Now that the grading of the angles are documented, the clinician may now choose the appropriate mydriatic that can be used safely if any at all. Most clinicians will use 1 gtt OU of 1% tropicamide followed by 1 gtt OU of 2.5% phenylephrine HCL five minutes later. Other mydriatics such as paremyd or 1% cyclopentolate may also be used in place of the first combination. After approximately thirty minutes the internal examination may begin.

At this point it would be wise to use the thirty minutes to perform a visual fields examination if the situation warrants the need for one. A controversy exists on whether or not this is an acceptable time to perform the visual fields. One study showed that clinically significant differences exists between a stationary pupil or a fully dilated and a pupil that is dilating while a perimetry test is being performed[vi]. With this in mind, most practitioners like the visual field performed under a consistent circumstance (i.e. always while dilating, undilated, or fully dilated). As long as the field is performed under the same condition during each visual fields exam. The key is consistency. Some of the earliest visual field defects indicative of glaucoma would include the beginnings of a central-cecal or nasal step defect. A general and diffuse loss of sensitivity over the entire field may also be a sign of glaucoma. Due to the learning process that occurs while taking a visual field test, it is recommended that a minimum of at least two subsequent fields be used to aid in the diagnosis of glaucoma.

A quick slit lamp exam of the crystalline lens may begin the internal exam. A clinician will look for any swelling of the lens due to a mature cataract which can cause pupillary block or any exfoliation / pseudo-exfoliation of the anterior capsule.

Still using the slit lamp, the vitreous humor should be evaluated using a condensing lens like a 90D. The vitreous should appear optically empty and clear. Floaters or a PVD are normal findings. If any type of blood, pigment or inflammatory cells are found, then further investigation is necessary to find the cause or underlying condition.

An experienced clinician will evaluate the optic nerve head using a condensing lens of his/her choice. The optic disc are looked at to determine the health of the optic nerve and blood vessels as they enter the eye. Each disc is displaced slightly nasal as they enter the eye. While examining the optic discs, the cup to disc ratio (C/D) is determined. The C/D is recorded in horizontal and vertical meridians. A recent study found that 84% of the population has C/D ratio's of less than 0.74 horizontally and 0.64 vertically[vii]. The rim tissue is also evaluated. The rim tissue has a slightly pinkish hue to it and it is fairly circular to slightly oval. Pallor or paleness in any part of the optic disc should be noted and evaluated further. If notching of the inferior or superior rim observed it may be indicative of glaucomatous damage. The blood vessels should rest upon the rim tissue and should not be suspended in the optic cup. The caliber of the vessels is noted as well as the size of the reflex from the light source off of the vessels. Hemorrhages near the disc could point to PVD's, systemic hypertensive retinopathy, diabetes, leukemia or glaucoma[viii]. The nerve head should be flat and not swollen which suggests papilledema or disc edema. With these conditions the margins of the optic nerve head will appear blurred or indistinct. If the condition is severe enough retinal folds may be seen near or around the optic nerve head[iv] . As a final check always compare the appearance of the two nerve heads with each other and note any differences. If a difference of 0.2 exists between the two nerve head C/D ratio's this is considered a sign of glaucoma. Ninety-nine percent of the time the two optic nerve heads will appear alike.

After evaluating the optic nerve head, the macular area is evaluated. The macula is located disc diameters temporal and ½ disc diameter inferior to the optic nerve head. It is 5mm in diameter. With glaucoma one of the earliest sign may be a very subtle color defect. Any decrease in a person's vision should alert the clinician to carefully investigate the macula. While viewing the macula with a light, a small bright spot of light is observed centrally, the fovea. If the reflex of light off of the fovea is not visualized it may be a clue that the macular area is not flat and may have macular edema, a macular hole or fibrosis. Among the conditions that cause macular edema are diabetic macular edema and central serous choroidopathy. Also common to older individuals is mottling of the macular pigment. The macular area will appear roughened with spots of darker pigmentation scattered around the fovea. A common finding in the mature population is drusen. These are believed to be lipofuscin deposits found between the retinal pigmented epithelium and Bruch's membrane. This is one of the earliest signs of age related macular degeneration.

While observing the macular area, it is especially important to look at the nerve fiber layer. It arcs above and below the macula. There is also a bundle of fibers that

goes directly from the macula to the optic nerve head. This bundle is the papullo-macular bundle. The fibers appear as striations on the surface of the retina and many times are difficult to see. A common finding in the nerve fiber layer is medulated nerve fibers. They will appear as feathery white striations heading towards the optic nerve head. The borders will be indistinct and nothing below the fibers is visible. Using the cobalt filter on a slit lamp with the condensing lens, experienced clinicians may be able to pick up early signs of glaucoma. They will appear as striations with a defect such as a slit or wedge missing within the striations. This is one of the earliest signs of glaucoma.

Once this is completed a brief examination of the retinal periphery is done. The periphery should be flat and appear reddish in color. Less retinal vasculature will be seen in the periphery, but venous ampullae in the choroidal layer will be seen. They will appear at approximately the 1, 5, 7, and 11 o'clock positions. Another commonly seen landmark is the dark brown to black ora serrata. Any hole or tear in the retina will show up as a bright red area that is easily distinguished from the surrounding retina. If a hole is noted in the periphery, then scleral indentation must be performed to rule out any fluid cuffs or detached sensory retina. Some other common findings are hyperpigmented spots and nevi found in the peripheral retina. One must be careful to note the size and location of any possible nevi to make sure they are not increasing in size over time. One must be careful not to mistake a nevus for a sub-retinal neovascular net. This can be differentially diagnosed using a red free filter or fluoroscien angiography.

At this point it would be wise to take stereoscopic fundus pictures of the optic nerve head for future comparison. These may be used as a baseline in which any changes in the C/D ratio's or rim tissue can be compared at future follow-ups. These photo's should be documented and kept with the patients record. Visual field results, IOP measurements and a target pressure should be documented. These will guide the clinician in future management decisions.

Once this data is gathered the clinician must determine if the patient does indeed have glaucoma and if treatment should be instituted immediately. Most clinicians agree that the early the detection and diagnosis, the better the patients chances of prolonging his/her sight. So, in essence the first major step is the glaucoma evaluation.

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