



Gaza Ophthalmic Centre

8.1 MEDICAL RETINA

(Part 1)

Ophthalmology

FOR GP's & MEDICAL STUDENTS

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Gaza Ophthalmic Centre

2021

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.Good morning. This is part one of the lecture about medical retina

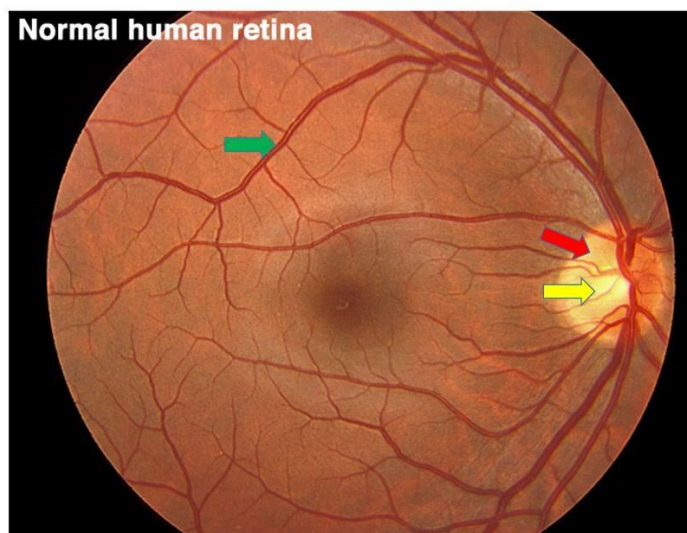


Fig. 12a. Fundus photo of a normal human retina.

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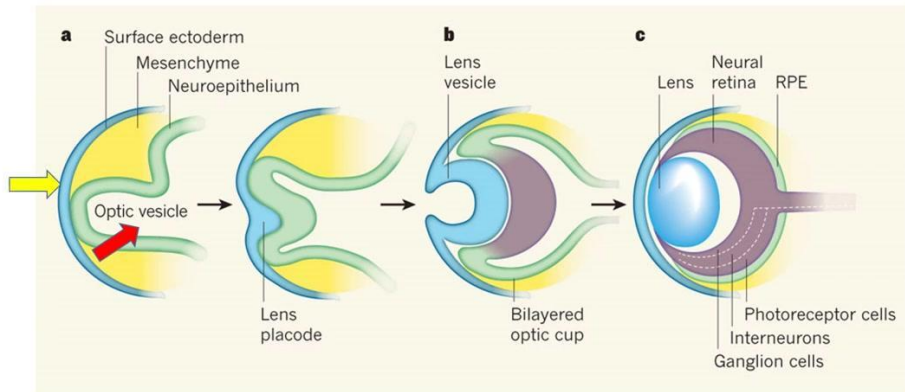
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This is the normal fundus where you can see the optic disc and the optic cup. Then we have to recognize the upper temporal arcade, the lower temporal arcade and the macula is the .area in between the arcades and the fovea is in its center

Retina Basics



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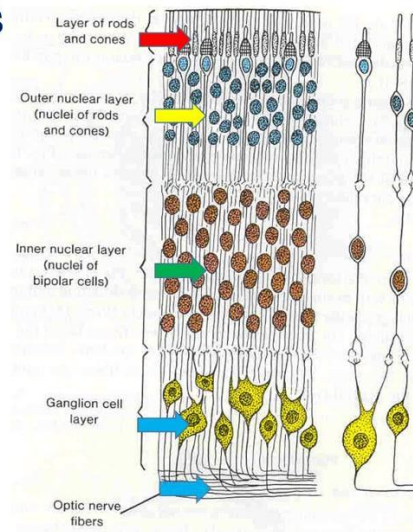
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The eye arises mainly as outpouching called optic vesicle from the forebrain, which goes outward to meet with surface ectoderm. Finally, after several stages in development, the optic vesicles formed the retina and the retinal pigment epithelium. So the retina is part of ? the brain while the ectoderm form the lens from

Retina Basics



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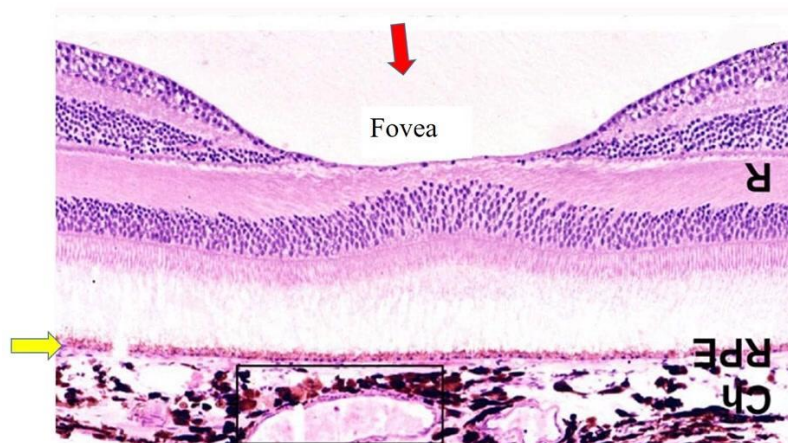
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the retina is multi layered structure. The first we have a layer of the rods and cones which are the photoreceptors, followed by what we call the outer nuclear layer, which are the nuclei of these photo receptors, then the inner nuclear layer the nuclei of the bipolar cells, and finally we have the ganglion cell and the nerve fiber going out forming the optic nerve after leaving .the globe through the optic disc

Retina Basics



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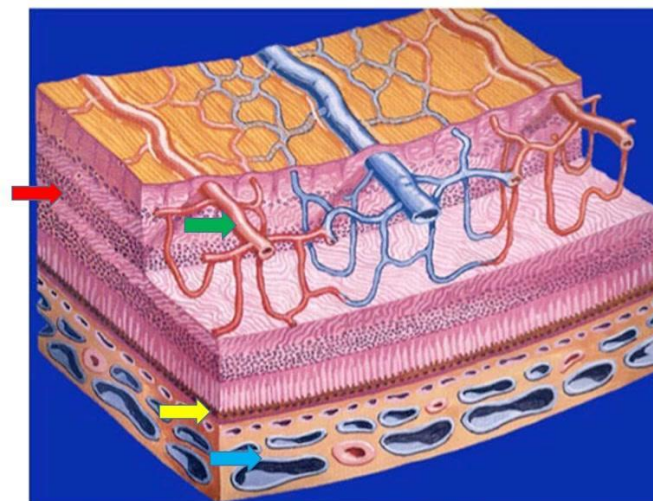
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At the middle of the center of the retina there is the fovea which is the central depression. In this area, there is a changes in the retinal structures here we can see the retinal pigment epithelium and then in between the epithelium and the vitreous, there are only the photoreceptor cell and the nuclei of the photo receptors. The choroid is the outer part .outside of the retinal pigment epithelial

Retina Basics



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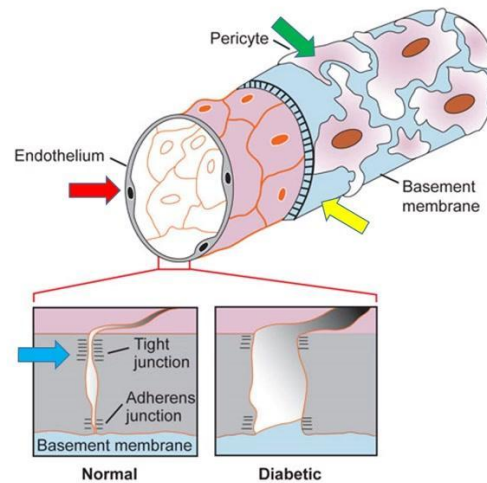
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blood supply of the retina is derived from two sources. This is the retinal pigment epithelium we found that the inner retina is derives its blood supply from the branches of the retinal central artery, while the outer parts and layers of the retina are supplied by diffusion from .the choroidal vessels through the retinal pigment epithelium

Retina Basics



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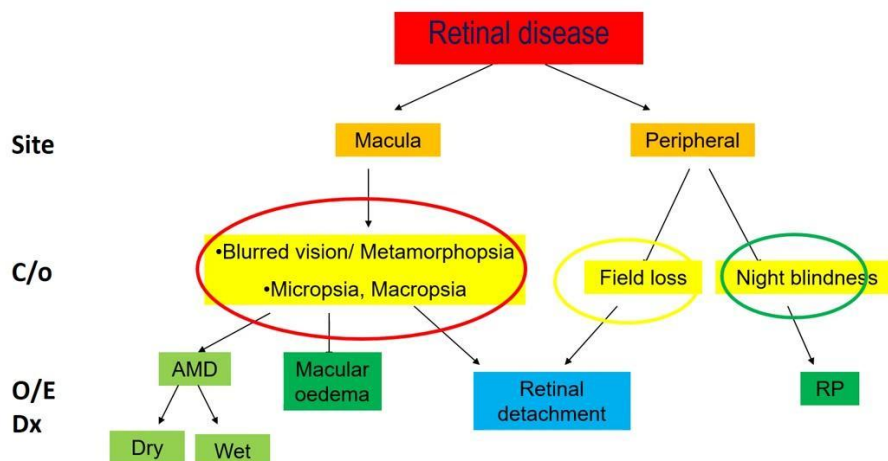
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Retinal

vessels are different from the vessels anywhere else in the body and having in into endothelium nonfenestrated with tight junctions between the epithelial cells. Of course this have a very well developed basement membrane and another layer of pericytes. the tight junctions make the capillaries impermeable, so nothing or fluid cannot exude. However in some diseases like diabetes mellitus, for example, which damages the endothelial ,the basement membrane and the pericytes leads to leaky junctions, and then fluid can exude .out of the blood vessels causing disease

Retinal Disease



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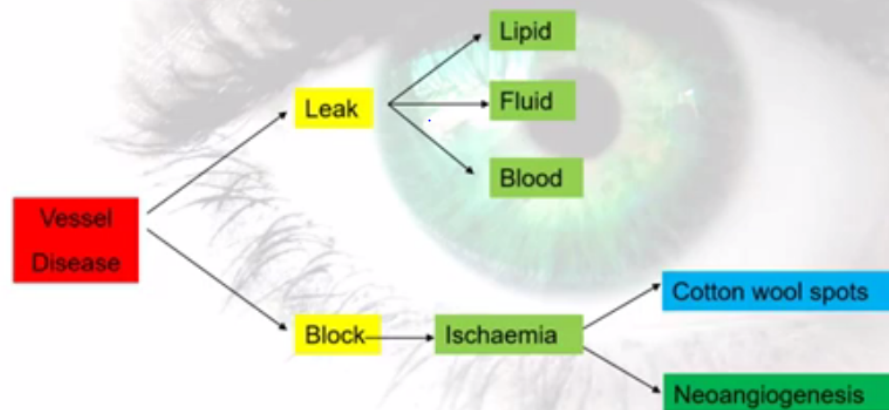
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retinal disease and its symptomatology depends on the site of the retina affected. retinal disease can affect either the macula in the center or the periphery of the retina. If the macula is affected, the patient will start to complain early from blurred vision metamorphopsia ,micropsia. on examination we can find for example, signs of age related



macular degeneration, whether dry or wet, or we can find macular edema as we see in diabetes mellitus, or there might be a retinal detachment .in the periphery,There. The complaint is either field loss or night blindness. field loss can once again be due to retinal detachment, while night blindness is a hallmark of retinitis pigmentosa, a hereditary disease .of the retina

Retinal Vascular Disease



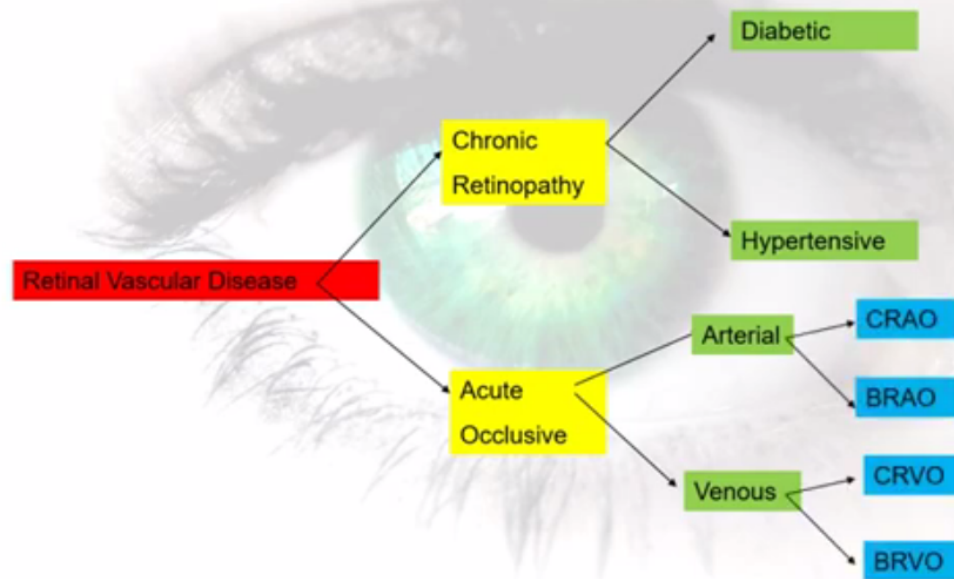
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Retinal vascular disease leads to either leakage from the vessel or blockage of the vessel, leakage can leak Lipid, fluid, water or blood. while block is causing ischemia and capillary non perfusion. The ischemia can lead to cotton wool spots and finally can lead to new vessel .formation, Neo angiogenesis

Retinal Vascular Disease



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Retinal vascular disease can be acute symptoms and signs when it is occlusive. Or it can give rise to retinopathy when it is chronic. retinopathy The major two types are diabetic retinopathy and hypertensive retinopathy. However, acute occlusive disease depends .whether it is arterial or venous, and each of them can be central or branch occlusion

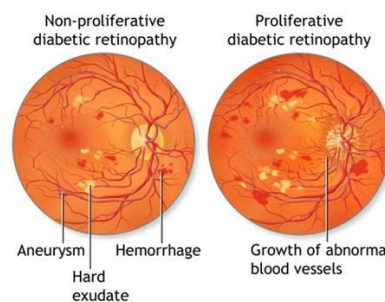
Diabetic Retinopathy Classification

1. NON-PROLIFERATIVE

1. Background
2. Preproliferative

2. PROLIFERATIVE

3. MACULOPATHY



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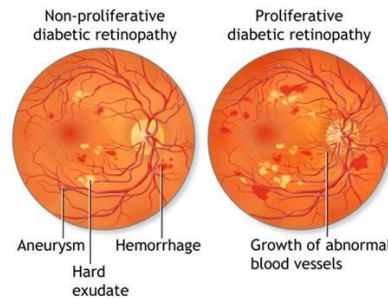
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Diabetic Retinopathy can be classified to either non proliferative or proliferative the non proliferative is further divided into background or pre proliferative which is a severe form. maculopathy is a separate entity which can happen with either proliferative or non .proliferative disease

Non-Proliferative Diabetic Retinopathy

1. Microaneurysms
2. Dot Hge
3. Hard exudates
4. Nerve Fibre Layer infarcts
 - (Cotton Wool Spots)
5. Microvascular abnormalities
6. **MACULAR OEDEMA**



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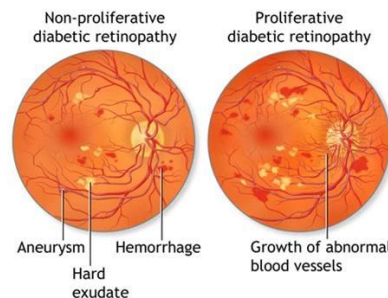
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nonproliferative diabetic retinopathy is characterized early by microaneurysm, dot hemorrhage and hard exudates. Later on nerve fiber layer infarcts or cottonwood spots might start to appear together with micro vascular abnormality. macular edema can .complicate early or late non proliferative diabetic retinopathy

Proliferative Diabetic Retinopathy

1. Neovessels
2. FIBROVASCULAR MEMBRANES
3. CYTOFIBROUS MEMBRANES



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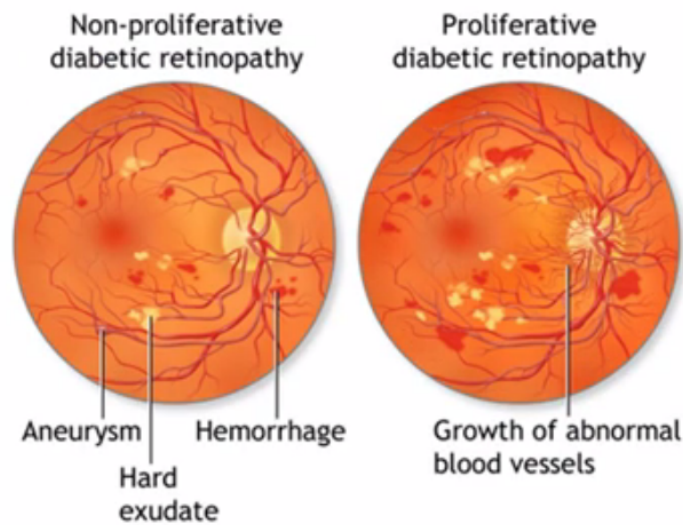
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proliferative diabetic retinopathy is characterized by Neo vessels, which give rise to either fibrovascular membrane, which can also give rise by cytofibrous membrane as in end stage .with contracture and complication

Diabetic Retinopathy



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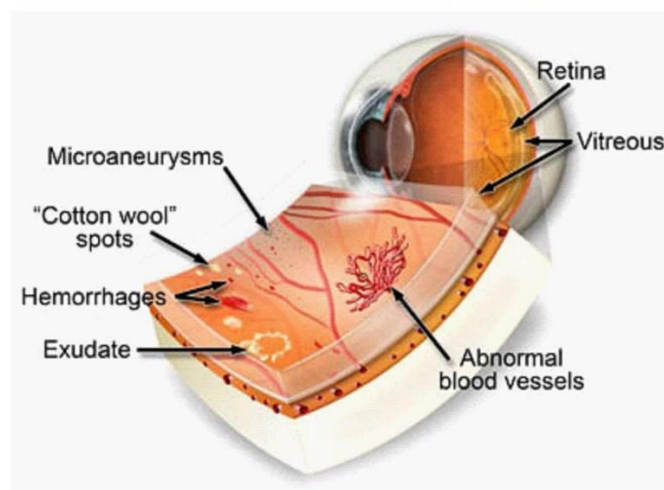
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Here on the left side, we found the non proliferative diabetic retinopathy with the aneurysm, hard exudates and minute hemorrhages. On the right side we have the proliferative which .much severe disease with the growth of abnormal blood vessels on the disk and elsewhere

Proliferative Diabetic Retinopathy



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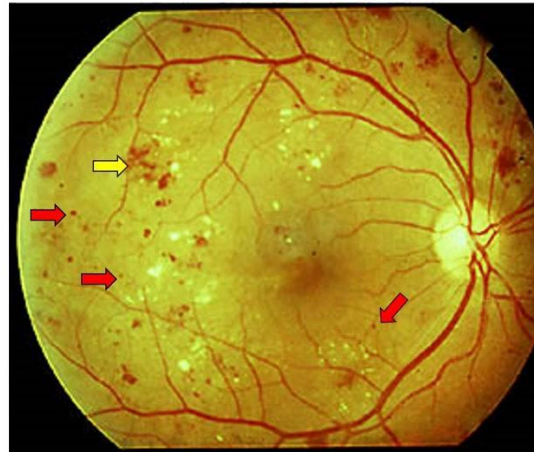
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This is a 3D diagram of the diabetic retinopathy. So while most of the signs are intraretinal, we can note that the abnormal blood vessels or Neo vessels are actually starting from the .retinal vessels, however, they rise up and invade in the vitreous



Non Proliferative Diabetic Retinopathy

1. Microaneurysms
2. Dot Hges
3. Hard exudates



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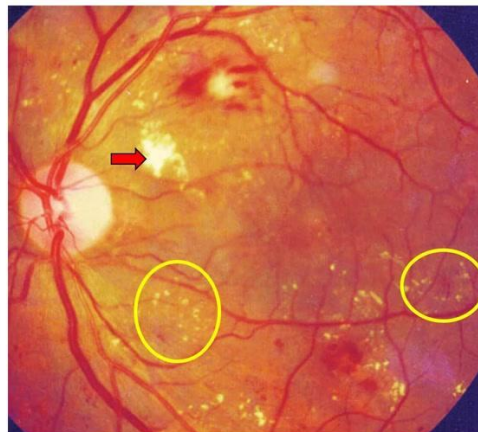
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In the case of non proliferative diabetic retinopathy, we can see microaneurysms which like small red spots dot hemorrhages which larger bit and hard exudate with sharp edges and .well demarcated outline

Pre Proliferative Diabetic Retinopathy

1. Hard exudates
2. Circinate exudates
3. Blotchy Hges
4. CWS



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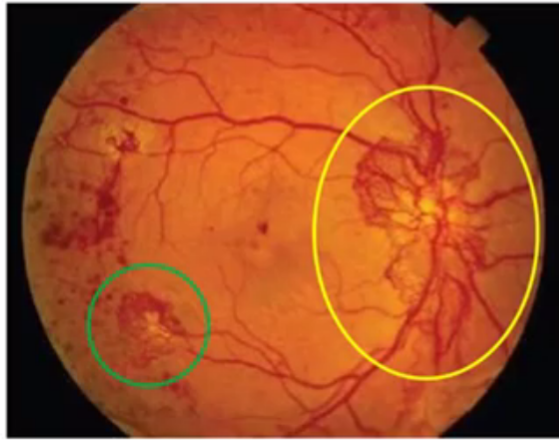
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in preproliferative diabetic retinopathy which is a severe form of non proliferative, we find in addition to hard exudates We find circinate exudate which arise around a might leaking .capillary, we start to notice blotchy hemorrhages and cotton wool spots

Proliferative Diabetic Retinopathy

1. NVD
2. NVE



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The hallmark of proliferative diabetic retinopathy is new vessels, new vessels near the disk, on the disk are called NVD. While new vessels anywhere else in the retina is called NVE. This is a NVD and This is an NVE

Treatment of Diabetic Retinopathy

1. Medical control of DM
2. LASER
3. Anti VEGF
4. Surgery



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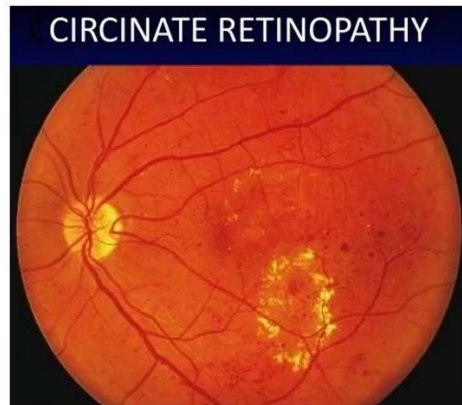
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Treatment of diabetic retinopathy basically depends on the good control of diabetes mellitus. Laser is a mainstay of the treatment and newly the anti VEGF vascular endothelial growth factors have been showing great success in treating especially macular edema and new vessels. surgery is reserved for treating the complication of severe proliferative diabetic retinopathy

Laser Treatment

- Circinate Maculopathy
 - Focal laser treatment



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Laser treatment can be either focal laser treatment, for example, to occlude the leaking the new vessels at the center of the source in the macula, or it can be banned retinal photocoagulation for treating proliferative diabetic retinopathy with new vessels

Hypertensive Retinopathy

Keith Wagener Barker (KWB)

- Grade 1
 1. Generalised arteriolar constriction
 2. Silver wiring
 3. Vascular tortuosity
 4. Copper wiring
- Grade 2
 - Grade 1 + AV nipping
- Grade 3
 - Grade 2 + cotton wool spots and flame shaped haemorrhages
- Grade 4
 - Grade 3 + papilledema

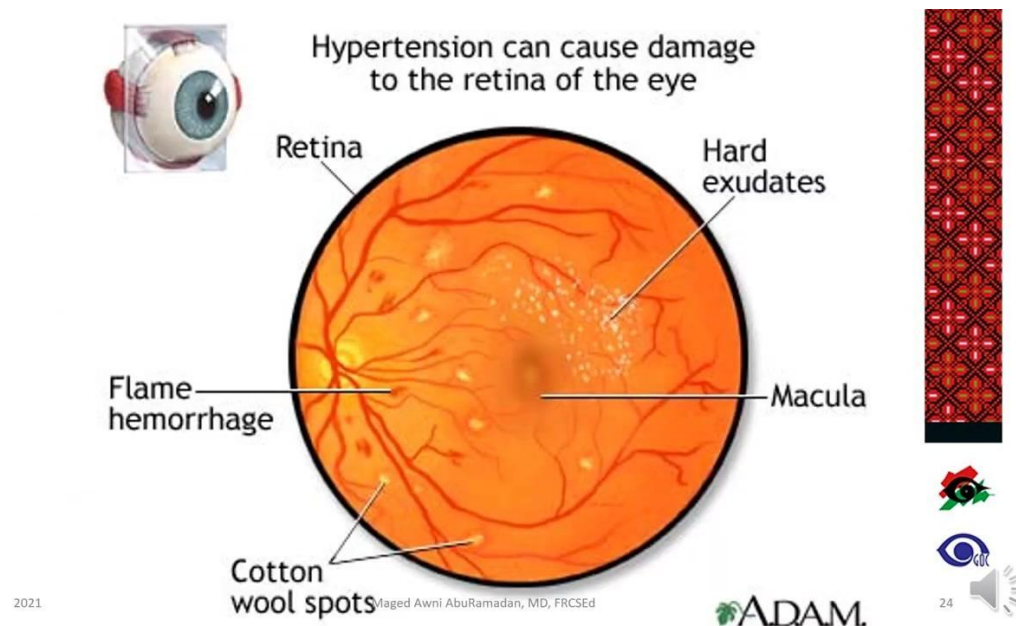
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hypertensive retinopathy have a characteristic signs that we can see in the fundus like generalized arterial constriction, silver wiring, which means increased reflectance of light from the sclerotic blood vessel, the blood vessels are tortuous and copper wiring is the end stage of the severe sclerosis. These signs are called grade 1 at the keith wagener barker Classification. Grade 2 is the same however it have AV nipping which means the deflecting of the veins or counter or crossing with the arteries and grade 3 have in addition signs of ischemia like cotton wool spots and flame shaped hemorrhage which is characteristic for

hypertensive retinopathy. Grade 4 is all of the above plus papilledema due to severe .ischemia



Here we can see the flame shaped hemorrhages near the disk, we can see macular edema, .cottonwood spots as well as some hard exudates

Retinal Arterial Occlusion

1. Transient
 - Amaurosis Fugax
2. Permanent
 - Sudden painless
 - Loss of vision
- Signs
 - Cherry Red Spot

vascular occlusion of the central retinal artery or its branches can be either transient causing amaurosis fugax, or temporary blindness or permanent, which the patient complains of sudden painless loss of vision. The whole sign of retinal artery occlusion is the macular .edema and the cherry red spot

Central Retinal Artery Occlusion

1. Pale White Macular Edema
2. Cherry Red Spot



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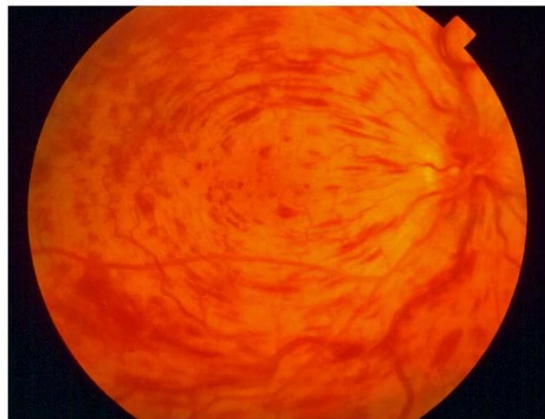
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here in this picture we can see an example of central retinal artery occlusion. The macula is pale white due to the edema and the cherry red spot is the red color of the coroid blood vessels showing through the fovea. You can also see optic disc swelling and pain and some .micro hemorrhages as well

Central Retinal Vein occlusion

1. Extensive Retinal Hges
2. Macular edema



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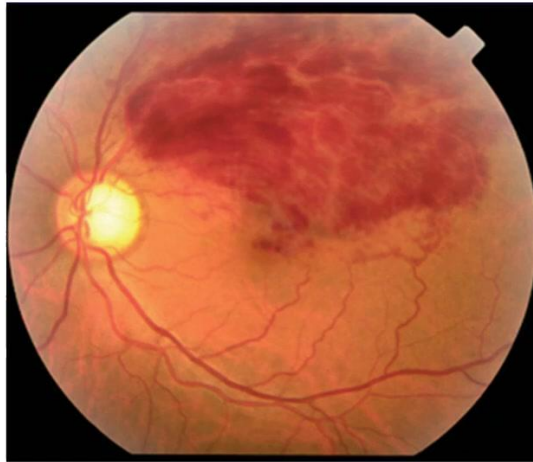
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central retinal vein occlusion On the contrary, you can see severe and extensive retinal .hemorrhages all over the place with severe macular edema

Branch Retinal Vein Occlusion

1. Sectoral retinal Hges



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Branch retinal vein occlusion is the same however it affects either the upper or the lower .temporal vein so it is sectoral retinal hemorrhages. Macular edema is also severe in this case

Retinitis Pigmentosa

1. Genetic disorder
2. XR / AR / AD
3. Rhodopsin
4. Photoreceptors



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retinitis pigmentosa is the name given to a syndrome of multifactorial and multimorphic sort of diseases. They can usually it is genetic and hereditary, it can be x- linked recessive, autosomal recessive or autosomal dominant. The major uniform sign in that there is a .problem with the rhodopsin synthesis and the photo receptors

RP - Symptoms

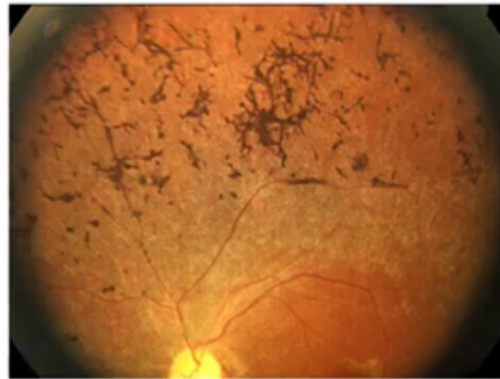
1. Decreased Night vision
2. Tunnel vision
3. Blurred central vision
4. Cataracts
5. Macular oedema



The patient usually complained of decreased night vision because the disease affects the periphery of the retina which is used as scotopic vision. When that becomes very severe. The constriction of the visual field keeps narrowing and narrowing then it gives only tunnel vision. And at the end when the macula itself is affected. There will be blurred central vision .also vision can be affected by the Associated presence of early cataracts or macular edema

RP - Investigation

1. Visual Field mapping
2. Electroretinography
3. DNA testing



The fundus picture is usually characteristic however, visual field mapping electroretinography .or DNA testing may be needed for further classification and family consultation

Retinitis Pigmentosa

1. Pale Optic Disc
2. Bone spicule pigments
3. Attenuated BV



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The major signs are a pale optic disc and the bone spicule pigment changes which is characteristic as well as a very attenuated blood vessel

RP Treatment

1. Systemic association
2. Vitamin A
3. Genetic therapy
4. Associated cataracts



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Treatments for RP are usually for treating the systemic Association, vitamin A supplements in cases secondary to deficiency of vitamin A, genetic therapy is on the trials phase and if there is associated cataract then removing that will give at least temporary improvement of vision

Extra points

SYNDROMES

- ?Deaf →
- Usher
- ?Ophthalmoplegia →
- Kearns-Sayre

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Some points to note is that there are hundreds of syndrome which can share retinitis pigmentosa as part of the syndrome. Special note have to be with a patient also have deafness then Usher syndrome can be a cause, or if there is ophthalmoplegia kearns sayre .syndrome which also have a heart block and other manifestation should be suspected

Macular Degeneration

- Age-Related Macular Degeneration (AMD)
 1. Loss of vision
 2. Over the age of 50
 3. Caucasians
 4. Familial?

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Macular Degeneration usually happens in age related macular degeneration AMD .characterized by sudden loss of vision, it's usually in elderly, Caucasian maybe or familial

Macular Degeneration



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This is on the left what a normal person can see. But on the right, you can see that the middle portion the central portion of the visual field is most affected and the patient cannot see well cannot fixate and certainly the visual acuity is decreased much

Drusen



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Drusen is a lipofuscin accumulation underneath the retinal pigment epithelium, it can be familial , like in this case, or it can be due to age related macular degeneration. drusen itself does not affect the vision. However, it is a sign that something wrong is going into the macula .and in its metabolism

Dry AMD



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AMD is described as being dry as we see in this picture, we can see that there is an atrophy in the central part of the macula involving the fovea. And this by itself can lead to much of .visual loss of central vision

Wet AMD



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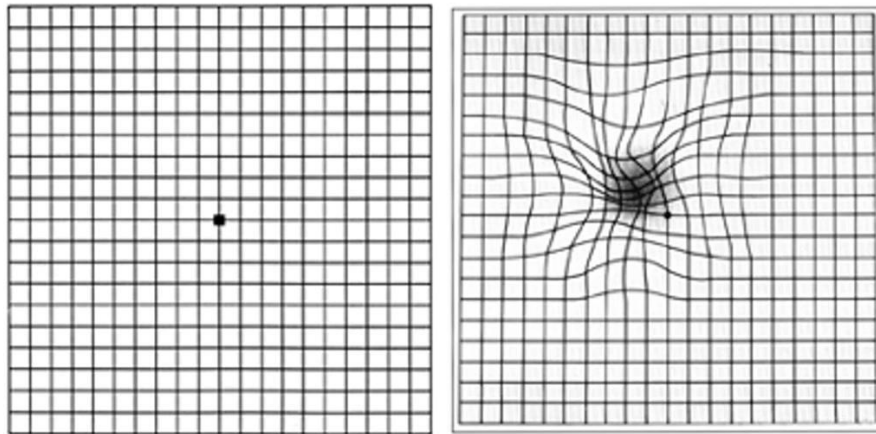
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However, wet AMD is when subretinal neovascular membrane forms underneath the dry one, and then that starts to hemorrhage when there is sudden severe loss of vision involving a larger area of the macula. So the severity of the disease in the central scotoma is much .larger than in dry age related macula

Amsler Grid



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For patients who are elderly and who have a drusen And their vision is good, but they might be subjected to develop age related macular degeneration, we can give them a simple self test called Amsler grid, which is a cardboard chart like this, you ask the patient to close one eye with the other eye look at the black spot in center and then see whether all the lines are clear. If that's the case, then his vision is Good and he is on right ,he have to do that every day rising from sleep in the morning. However, if there's anything wrong in the macula, then he might start to see either visual field defect or distortion or metamorphopsia . This irregular lines are an example of how a patient with metamorphopsia can see Amsler grid .and then he should seek help medical help immediately before it gets any worse

Potential Methods of Treatment

1. Laser treatment
2. Anti VEGF
3. Stem cells

Potential methods of treatment are under trial laser can rarely be used however anti VEGF is giving a lot of Promise, stem cell implantation is also giving hope in the recent trials

Thank you