**Sudan University of Sciences and Technology**

**College of Medical Radiology Sciences**

# *Study of Eye in Diabetic Patient Using Ultrasonography*

# *دراسة لعيون مرضي السكري باستخدام الموجات الصوتيه*

**A Thesis Submitted in Partial fulfillment of the Requirement of Masc. Degree in Medical Diagnostic Radiology Technology**

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2018

# الأيـة

بسم الله الرحمن الرحيم

قال تعالى:

# (وَفِي أَنفُسِكُمْ أَفَلَا تُبْصِرُونَ)

صدق الله العظيم

سورة – الذاريات { 21}

# Dedication

I dedicate my research to my mother

To my husband and my Sons

And To lila Bebers

To my friends and everyone was ear to me and help me

# Acknowledgment

I'm grateful to the Allah for the good health and willing that were necessary to complete this research.

I thank my supervisor **Dr. Muna Mohamed** For providing me with all the necessary facilities for the research.

My thanks also extend to all my doctors who helped me in mastership program.

# Abstract

This was cross sectional descriptive study for eyes of diabetic patient for  of ultrasound in Makaa hospital eye, Omdurman in This, which was carried out during the period from October 2016 to May 2018. This study included the150 patients age between (25-  above 45) years old .

Study to determine the causes of vision defect of eye in diabetic patient used  Using a Nidek (Echoscan US-4000) ultrasonic unit with a high frequency direct contact 10 MHz .Transverse probe position  before apply ultrasound gel in the probe.

The study results found that the females were more affected (60%) than the male (40%). The most affected age groups were elderly patient more than 45 years and this result agree with what mentioned in the previous study.( Eman Ahmed2017)

Also, the study that the ultrasound could be able to image the interior  of ocular structures and therefore can diagnose any pathological change for diabetic patient and U/S findings shows that Cataract Normal U/S 21(14%) finding, the patient with Retinal detachment (10%),patient with Diabetic retinopathy U/S findings vitreous Hemorrhage(6%)  and Glaucoma patient Normal U/S findings(11%).

The concluded of study found that there was significant correlation between duration of disease and US finding p. value (.05) also there was significant correlation between age and US finding p. value (0.01

The study recommended that the color Doppler ultrasound must be available in all eye centers to assist in diagnosis and follow up of the eye diseases. Also recommended a well knowledge and trained sonographer should perform the ocular ultrasound and detailed information about ocular ultrasound must be available to the medical field participants.

# ملخص البحث


هذه الدراسة الوصفية أجريت بقسم الموجات فوق الصوتية في مستشفى مكة للعيون أمدرمان في الفترة من أكتوبر 2017 إلى مايو 2018 وشملت دراسة عدد 150 مريض يعانون من مرض السكري أعمارهم بين 25 واكبر من 45 سنة.

وهدفت هذه الدراســة لتقيـيم دور الموجــات فـتوق الصوتية في حـالات أمـراض العيون لمرضى السكري ومعرفه اسباب تدني قوه البصر .

إستخدمت هذه الدراسـة أجهزة الموجـات الصــوتية نايدك مـوديل400 ماسـح بتردد عالي 10 ميقاهيترز لتحسين جودة الصورة.بوضع افقي للماسح بعد وضع الجل في الماسح.

توصلت الدراسة ان النـساء اكـثر عرضـة من الرجـال بنسـبة 60%لامـراض العيون واكثر فئة عـمرية تتأثر هم كبار السن من 45 فما فوق و هذا يتفق مع الدراسات السابقة (ايمان احمد 2017) .

وقد توصلت الدراسة لمقدرة الموجات فوق الصوتية لتصوير أجزاء العين وتشــخيص كل التغيرات التي تطرأ عليها عند مرضى السكري، وأكثر الأمراض الماء الابيض ونتائج الموجــات فـوق الصوتية الطبيعيه 21 (14% )، انفصال في الشـبكية (10%)والاعتلال السكري مع وجود نزيق قي العين (6%) ومرضي الجلاكوما (الماء الاسود ) مع ونتائج الموجــات فـوق الصوتية الطبيعيه (11%)

الدراسة وجدت علاقة بين الفترة الزمنية للمرض ونتائج الموجــات فـوق الصوتية وأيضاً بين أعمار المرضى وعتلال النظر ونتائج الموجات فـوق الصوتية.

أوصت الدراسة بتوفير الموجات فوق الصوتية الملونة (دوبلر ) في كل أقسام الأشعة التشخيصية حتى يسهل متابعة وتشخيص أمراض العيون المصاحبة لمرضى السكري.

وكما أوصت أيضاً بتوفير المعرفة والخبرات والتدريب الكافي لاختصاصي وتقني الموجات الصوتية وذلك لتوفير معلومات دقيقة عن نتائج الفحص لبقية الحقل الطبي المشارك في العلاج

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## List of Abbreviations

| | |
|---|---|
| US | Ultrasound |
| BSI | Brain Stem Infarction |
| CNS | Central Nervous System |
| DM | Diabetic Mellitus |
| DR | Diabetic RetinoPathy |
| F F A | Fundus Fluorescein Angiography |
| F.B | Foreign Body |
| I O P | Intra Ocular pressure |
| IO | Infra Orbital |
| IV | Intra Venous |
| MHz | Mega Hertz |
| MRI | Magnetic Resonance Imaging |
| O D | Oculus Dexter |
| OA | Ophthalmic Artery |
| OCT | Optical Coherence Tomography |
| ODS | Optic Disc Swelling |
| ONSD | Optic Nerve Sheath Diameter |
| OS | Oculus Sinister |
| OU | Oculus Uterque |
| OVS | Optic Vein Thrombosis |
| P V D | posterior Vitreous Detachment |
| Pt | Patient |
| R D | Retinal Detachment |
| SO | Supra Orbital |
| V H | Vitreous Hemorrhage |
| yrs | years |

# Chapter one

## 1.1 Introduction:

Since its first ocular application in 1956, ultrasound has had a broad impact on the practice of ophthalmology. It is now a standard clinical modality for measuring ocular dimensions, diagnosing and monitoring ocular diseases, and providing information regarding orbital diseases. Modern ultrasound systems provide real-time, highly detailed images of ocular structures in a rapid, noninvasive manner, posing no significant threat of tissue damage. compared to other techniques that would also provide good data(such as optical coherence tomography, CT, MRI,...). Ultrasonography does not involve the contraindications that may have other techniques more expensive and less accessible as MRI (presence of metallic items, claustrophobia, etc....)optical coherence tomography (although it has some specific indications, especially in the optic nerve diseases for its high spatial resolution, it is also less more affordable than ultrasound). Contraindications for ocular US are rare; the main contraindication is suspected ocular globe rupture in patients with trauma or who recently underwent surgery because it may cause extrusion of ocular contents.( Cathy W Dibernardo … et al 2007)

## 1.1 Objectives

### 1-1-1 General objectives:

To study Patients with diabetes mellitus (DM) in Sudanese population using ultrasonography.

### 1-1-2 Specific objectives:

1. To find out ultrasound findings in patients with Type I (non-insulin dependent. Type II (insulin dependent) Diabetics with Diabetic retinopathy, Retinal detachment, Posterior vitreous detachment ,Cataract Glaucoma…ect
2. To assessment the diabetic patients by using B-scan ultrasonography. Patients that cannot assessment by fundus copy the intraocular structures is difficult or impossible due to opacity of cornea or dens cataract
3. To detect different intraocular disorders that cause vision loss or Vision defect.
4. To asses the retinal disorders in diabetic patients who have developed vitreous hemorrhage or detachment.

## 2.1 Theoretical back ground and Literature review :

### 2.1.1 Ocular anatomy:

Eyes are like windows to the outside world, but their intricacies and functionalities are far more extensive than. Those of any given glass window. They are able to capture, adjust, and transform light into a chemical code that only the brain can decipher. Each structure of the eye works in accord with the next – refracting, constricting, dilating and chemically reacting to convert patterns of light. This article uses the mammalian eye as a primary model and follows the path that light takes on its journey through the functional eye, detailing the essential components of one of the smallest, yet most complex organs in the body. Many have attempted to emulate its abilities, but even top-of-the-line digital single lens reflex cameras dare not compare with the elegant,efficient design infused in this multifaceted unit of anatomical machinery.**(** Ph.D Kent M. Van De Graaff…. et al 2010).

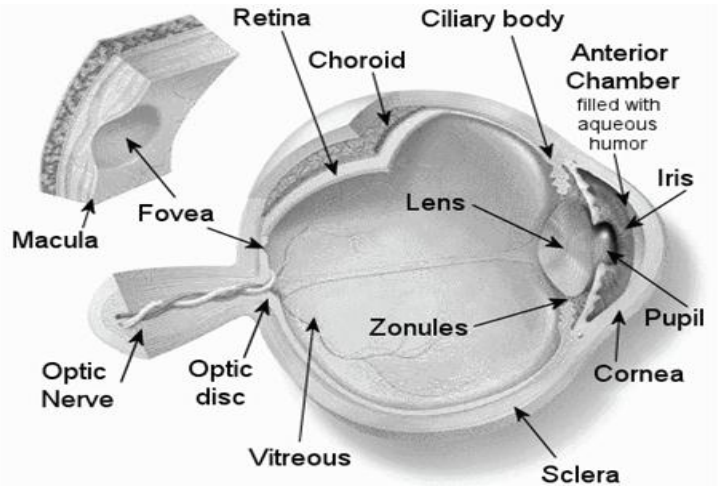


**Figure (2.1):** Cross-sectional view of the eye (*www.gimbeleyecentre.com/images/*)

### 2.1.2. Orbital Bone:

The orbital bones surround the globe and appear hyperechoic with posterior acoustic shadowing on ultrasound, similar to other bony structures that impede the ultrasound beam and create an artifact posteriorly. The orbital bones should have a smooth, sharp edge and any disruption may suggest an orbital fracture. (Ph.D Kent M. Van De Graaff … et al 010),

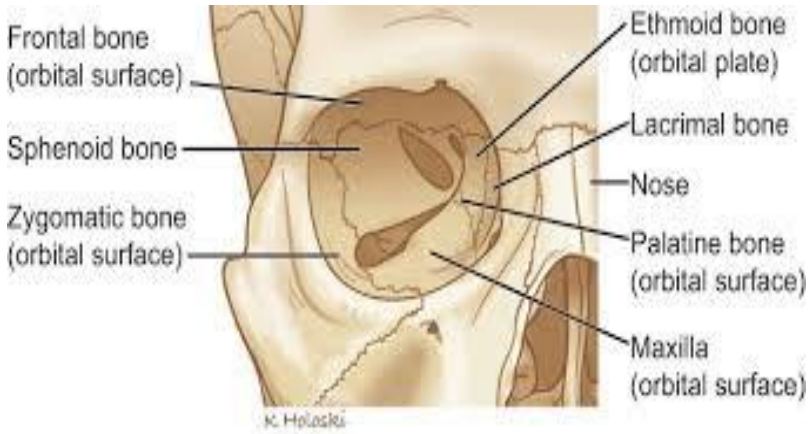


**Figure 2.2**: Orbital bones surround the globe and Orbital Walls (www.nature.com ) (2010)

### 2.1.3. The Orbital Walls:

Seven different bones form the orbital walls. Don't be intimidated by this complexity, however, as these bones are not that confusing when you break them down For example, the roof of the orbit is a continuation of the frontal. bone, the zygomatic bone forms the strong lateral wall, while the maxillary bone creates the orbital floor. This makes sense, and you could probably guess these bones from the surrounding anatomy. The medial wall is a little more complex, however, but is mainly formed by the lacrimal bone (the lacrimal sac drains tears through this bone into the nose) and the ethmoid bone. The thinnest area in the orbit is a part of the ethmoid bone

called the lamina papyracea. Sinus infections can erode through this “paper-thin wall” into the orbital cavity and create a dangerous orbital cellulitis. Despite the fragility of the medial wall, it is well buttressed by surrounding bones and rarely fractures. The orbital floor, however, breaks most often during blunt trauma. The maxillary bone fractures downward and the orbital contents can herniate down into the underlying maxillary sinus. This is called a "blowout fracture"and can present with enopthalmia (asunken-in eyeball)and problems with eye movements from entrapment of the inferior rectus muscle.(Tim Root, M.D2010)

### 2.1.4. Eye Muscles

Four rectus muscles control each eye. These muscles insert at the sclera, behind the limbus, and each pull the eye in the direction of their attachment. The superior, medial, and inferior rectus muscles are all controlled by the oculomotor nerve (III). The lateral rectus ,is controlled by the abducens (VI) nerve, which makes sense as the lateral rectus “abducts” the eye. The remaining two eye muscles are the superior and inferior oblique muscles. The superior oblique also originates in the posterior orbit, but courses nasally until it reaches the trochlea before inserting onto the eye. The inferior oblique originates from the orbital floor and inserts behind the globe near the macula. Because of these posterior insertions, the oblique muscles are primarily responsible for in torsion and extorsion (rotation of the eye sideways), though they also contribute some vertical gaze action. (Sidney L. Palmer, PhD …et al 2010 )

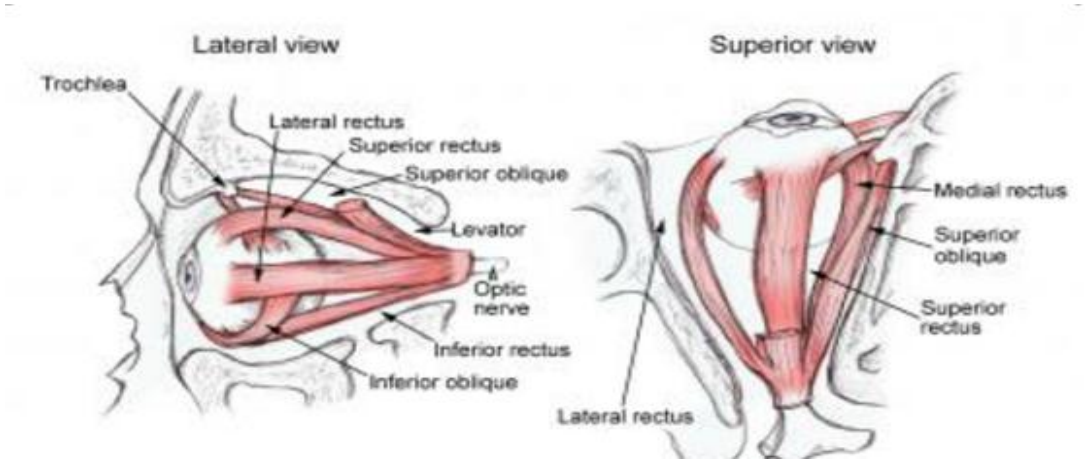


**Figure2.3:** Diaphragm show Eye Muscles A) Later view B)Superior view (www.researchgate.net/publication)

### 2.1.5. The cornea:

The cornea, which is a transparent body consisting of an epithelium, a thick fibrous structure made up of connective tissue and extracellular matrix, a homogeneous elastic lamina and a single layer of endothelial cells. The cornea protects the rest of the eye from germs, dust and other harmful matter. It filters the most damaging ultraviolet wavelengths of the sun's rays and is also the primary contributor in the focusing of light onto the retina. The cornea has a greater refractive index than that of air so that when light hits its surface, it slows down. The light beam's path is then bent and converges towards the centre of the eye, thus, reducing the image that has been refracted. Like most transparent media, the cornea bends light with minimal scattering, which allows a light beam to continue passage in its original direction. All of these intrinsic properties contribute to the formation of a discernible image and are made possible by the spatial uniformity of its cells, which contributes to its acuity of light transmission . (Ph.D Kent M. Van De Graaff … et al 2010),

Cornea contains five distinct layers. The outside surface layer is composed of epithelial cells that are easily abraded. Though epithelial injuries are painful, this layer heals quickly and typically does not scar. Under this lies Bowman's layer and then the stroma. The corneal stroma makes up 90% of the corneal thickness, and if the stroma is damaged this can lead to scar formation. The next layer is Descemet's membrane, which is really the basal lamina of the endothelium, the final inner layer. The inner endothelium is only one cell layer thick and works as a pump to keep the cornea dehydrated. If the endothelium becomes damaged (during surgery or by degenerative diseases) aqueous fluid can flow unhindered into the stroma and cloud up the cornea with edema.**(**Timothy Root, M.D (2010)

### 2.1.6. The pupil and iris:

Once light has passed the aqueous humor, it moves onto the next group of structures; the iris and pupil. These two structures regulate the amount of light passing through the system. The iris consists of a pigmented sheet of cells that lies directly in front of the lens and has the ability to restrict and dilate with the aid of sphincter and dilator muscles, respectively. This contraction and dilation regulates the pupil  the aperture of the eye. In cases of abundant light, the iris decreases the pupillary aperture with the aid of the sphincter muscles and tries to avoid the admittance of too much light, which would eventually result in the processing of a muddled blur. The opposite is true when light is lacking, and the pupil becomes greatly dilated in an attempt to gather as many photons of light as possible for imaging (Bruce et al., 1996).

### 2.1.7. The lens:

The lens epithelium layer covering a mass of lens fibers, is primarily made up of proteins called crystallins, which further refine the light from the cornea . Like the cornea, the molecules of the lens are densely packed and uniformly spaced characteristics required for its transparency. The lens has an inherently greater index of refraction than the cornea due to its surrounding environment namely the aqueous and vitreous humours which also have relatively high indexes of refraction. Thus, the index of the lens must be even higher if it is to focus the image further and contribute to the optical system. Though the lens has an inherent refractive index, it also has the ability to change its degree of refraction with the aid of ciliary muscles and ciliary zonular fibres in the process of accommodation. When the eye views an object at a distance beyond 6m (20 feet), the lens is forced to assume a flattened shape because the ciliary muscles and the zonular fibres holding it in place will pull it outward. When the eye focuses on an object within 6m, the lens is forced into a bulging shape by the contraction of the ciliary muscles accompanied with a reduced tension in the zonular fibres. This results in an increase in the lens' optic power which brings the focal point closer, effectively creating a clear image of an object that is within 6m of the viewer . (Ph.D Kent M. Van De Graaff … et al 2010),

### 2.1.8. The vitreous humour:

Occupying the cavity between the lens and the retina, the vitreous humour accounts for approximately two-thirds the volume of the entire eye. Composed 99% of water, with a small amount of collagen, the vitreous humour is clear and avascular, with a gel-like consistency. It serves as a transparent structure through which light, refracted by the lens and cornea, can pass; and it provides support for the delicate lens. The vitreous humour

is also in contact with the retina, though it only adheres to it at the optic nerve disc; it helps hold the retina in place by exerting a pressure on it against the choroid. Additionally, the vitreous humour is attached to the dorsal side of the lens and the ora serrata, the point at which the retina ends anteriorly. Once the vitreous humour has developed and reached its full size, it is stagnant . As the eye ages, the gelatinous vitreous shrinks, and more fluid is secreted to fill the vacancy, effectively diluting the vitreous humour in a process termed vitreous synaeresis. If the vitreous is detached from the eye's posterior region during this process, the occurrence of floaters in vision is likely. Aging, along with other retinal disorders can also cause the development of small holes in places where the retina has thinned.Vitreous humour can leak through those holes and cause retinal detachment from the underlying support tissue,which is detrimental to visual acuity and can lead to blindness.(Timothy Root, M.D2010).

**2.1.9.queous humour:**

Positioned between the cornea and the lens, the aqueous humour is formed by the ciliary epithelium of the ciliary body that is located in the posterior chamber. The aqueous humour is constantly replenished, as it flows through the pupil and fills the anterior chamber. From there, a large portion of aqueous humour leaves the eye through the trabecular meshwork into Schlemm's canal and the episcleral venous system. The remainder drains via the uveoscleral route by simple percolation through the interstitial tissue spaces of the ciliary muscle, continuing to pass into the suprachoroid and leaving through the sclera. The constant flow of aqueous humour into the eye regulates its ocular pressure so that the eye's optical properties can be maintained. This circulating flow also delivers oxygen and nutrients to the anterior region of the eye and removes metabolic waste products from its anterior chamber, as the avascular region near the lens and cornea

cannot rely on capillaries to serve this function .The aqueous humour also assumes a role in the local immune response by dispensing ascorbate, an antioxidant concentrated by the ciliary epithelium, throughout the eye. (Charman, 2008).

### 2.1.10. The Anterior Segment of the Eye:

The portion of the eye visible to the observer without special instrumentation is considered the anterior segment of the eye. Most of the structures responsible for focusing images onto the retina of the eye are here. The cornea is the primary focusing structure, providing about 75% of the focusing power of the eye. The crystalline lens provides the remaining variable focusing power and serves to further refine the focus, allowing the eye to focus objects at different distances from the eye. The iris controls the aperture or pupil of the eye for different light levels. The iris is actually an extension of the ciliary body, a structure that has multiple functions in the anterior segment, from production of the fluid that fills the anterior segment (aqueous humor) to suspension and control of the shape of the crystalline lens of the eye. ( Charman, 2008).

### 2.1.11.The Posterior Segment of the Eye:

The retina lines the interior of the posterior portion of the globe and is where images are formed. Initial processing of the image occurs at this highly specialized sensory tissue. Vitreous is the clear gel that fills the posterior segment and serves to provide for light transmission through the eye and to protect the retina Posterior Structures The structures posterior to the globe that can be seen easily by sonography include the optic nerve and it's sheath, the retrobulbarspace. ( Charman, 2008).

### 2.1.12. Retina:

The retina comprises the posterior wall of the eye and is normally adheres to the sclera. It appears as a smooth line without disruption outlining the posterior wall of the globe. The retina is usually not clearly delineated from the other choroidal layers on US unless it's disrupted. (Timothy Root, M.D2010).

Organization of the retina into the different cell and synaptic layers

The retina can be divided into many distinguishable layers. The outermost layer of the Neural retina is the Photoreceptor layer which contributes to the vertical transfer of signals in the retina. This layer consists of two types of photoreceptors rods and cone which are responsible for receiving and transforming photons of light to electrochemical impulses. The nuclei of these photoreceptor cells reside in the outer nuclear layer (ONL), projecting from there to the outer plexiform layer (OPL) and forming synapses with the dendrites of bipolar cells. This plexiform layer, thus, constitutes the first synaptic layer. Like the outer layers, the inner layers can also be divided into nuclear or plexiform layers. The inner nuclear layer (INL) contains the nuclei of bipolar cells, horizontal cells and the majority of amacrine cells, as well as the cell bodies of supportive glial cells. The INL borders the inner plexiform layer (IPL), where vertical communication between the bipolar cells and ganglion cells takes place, thus making up the second synaptic contact layer. The next layer, the ganglion cell layer (GCL), contains the cell bodies of the ganglion cells. The dendrites of these ganglion cells extend into the IPL layer, whereas their axons extend in the opposite direction into the nerve fibre layer (NFL). In this layer, all of the ganglion cell axons travel towards the optic disc. (Bruce et al., 1996).

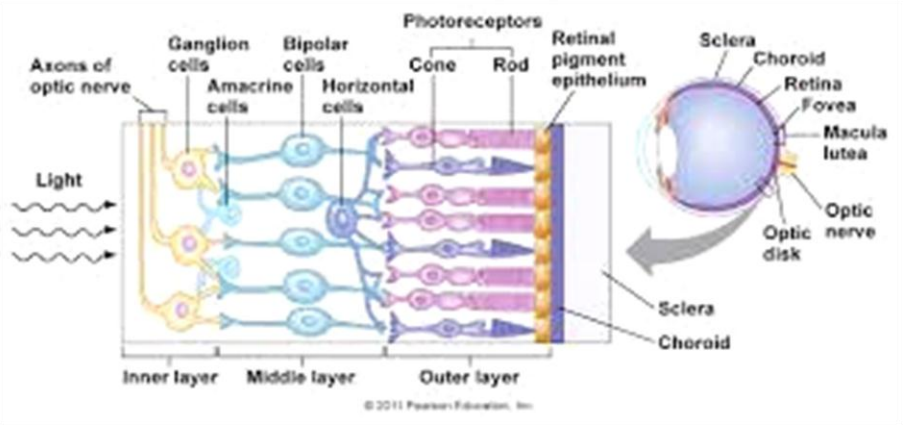


**Figure 2.4** Retina different cell and synaptic layers (Bruce et al., 1996).

### 2.1. 13 .The optic nerve and optic disc:

The optic nerve serves as the pathway connecting the retina to the brain's visual processing centre. The area where the optic nerve is crossing through the posterior fundus of the eye is called the optic disc, also termed the optic nerve head. Approximately 1.5mm in diameter, the optic disc is where the nerve fibers leave the eye en route to the brain; it is also where the central retinal vein exits the eye and the central retinal artery enters. Because the optic disc contains no photoreceptors, it creates a blind spot on the retina. It is the first division from the trigeminal nerve which is the fifth of twelve cranial nerves, consists of afferent sensory fiber . (Bruce et al., 1996).

### 2.1. 14. The choroid:

Is the vascular layer of the eye containing connective tissue that surrounds the globe. Located between the retina and sclera, the choroid is separated from retinal nervous tissue by two structures: Bruch's membrane and the RPE. Bruch's membrane, the basement membrane anterior to the choroidal vasculature, serves to mediate the passage of nutrients into the retina, and filter out retinal debris seeking an outlet through the choroid vessels. The choroid provides the greatest blood flow to the retina (65–85%of total

blood supply), allowing it to adequately supply oxygen and nutrients to the photoreceptors in the outer layers of the retina. (Bruce et al., 1996).

### 2.1.15. Blood supply:

The blood supply to the eye is primarily from the ophthalmic artery, which gives off its first branch, the central retinal artery. The central retinal artery and vein can be identified within the optic nerve sheath using color flow Doppler. Spectral Doppler can be used to obtain waveforms that depict the flow velocity within the blood vessels. These waveforms can be used to differentiate arterial from venous blood flow. (Timothy Roo.2010).

### 2.1.2. Ultrasongraphy anatomy :

Examination of a normal globe at high system sensitivity reveals two echographic areas, separated by an echo free area. The echographic area at the beginning of the scan represents vibrations at the tip of the probe and has no clinical significance. When the scan resolution is good, one could see the posterior convex structure of the crystalline lens. The large echo free area represents the vitreous cavity. The echogenic area after the vitreous represents the retina, choroid, sclera, and the orbital tissue behind it. The retina is seen as a concave surface proximally. The optic nerve shadow is seen as a triangular shadow within the orbital fat. The first few mm comprising the cornea, anterior chamber and anterior lens capsule are not easily visualized without adequate standoff or an immersion technique LensThe entire lens can be seen with the standoff technique or an immersion scan. It is seen as an oval high reflective structure with intralesional echoes varying from none to highly reflective depending on the amount of cataract. Vitreous This is acoustically clear but can show low reflective echoes depending on the amount of syneresis in older people. A senile posterior vitreous detachment can be seen in the elderly

as a smooth, mobile low reflective membrane having no posterior pole attachments. Retina, Choroid and Sclera All three are seen as a single high reflective structure. The layers are seen distinctly only in pathological conditions such as retinal detachment, choroidal effusion, scleritis, etc. Optic Nerve This is seen as a wedge shaped acoustic void in the retrobulbar region on an axial scan. This view however gives limited information. The vertical transverse approach at low gain settings is the ideal view for imaging the optic nerve. Extraocular Muscles These are seen as echolucent to low reflective fusiform structures within the orbit, extending posteriorly from their tendinous insertions towards the orbital apex. The superior rectus- LPS complex is the thickest and the inferior rectus is the thinnest of the muscles. The inferior oblique is usually not imaged except in pathological conditions.( Sankara Nethralaya… et al 2006)

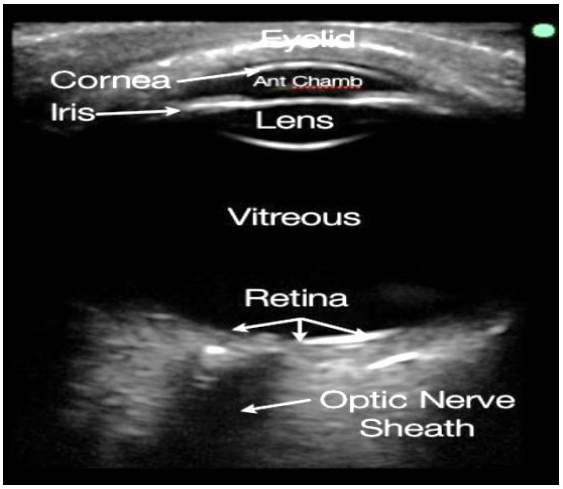


**Figure2.5:** Normal Ultrasongraphy vitreous cavity, concave retinochoroidal layer and the optic nerve show (Sankara Nethralaya … et al 2006)

## 2.1. 3.Ocular physiology:

Following the path of light through the vertebrate eye, we have journeyed through the different components that make the eye function as a perfect light-gathering and information processing organ. The light is first refracted adjusted, and focused onto the retina via the collaborative efforts of the cornea, iris, pupil, lens, aqueous and vitreous humour, ensuring that the right amount of light from the environment is captured and focused onto the fovea andmacula, then lost light-sensitive area on the retina responsible for the fine details of images. Once the light is focused onto the retina, the light signal is converted into electro chemical impulses via the teamwork of neurons and glial cells within the retina. The signal is then sent to the processing centre of the brain via the highway: the optic nerve. All other supportive components of the eye including the RPE, the choroid, the central retinal artery and the sclera are equally important for the proper functioning of the eye by providing protection, supplying oxygen and nutrients, as well as cleaning up its waste. The functions of the eye represent a symphony of activity that has been perfected over millions of years, resulting in each organism's detector of light. (Corina van de Pol2010)

### 2.1. 3.1.The Visual System Pathways to the Brain

The neural signals initially processed by the retina travel via the axons of the ganglion cells through the optic nerves, dividing and partially crossing over into the optic chiasm and then travelling via the optic tracts to the lateral geniculate nucleus (LGN). From the LGN, the signals continue to the primary visual cortex, where further visual processing takes place. The optic nerve of each eye consists of a bundle of approximately 1 million retinal ganglion cell axons. The nerve connects to the posterior aspect of the eye in a position that is about 15° nasal to the macula. The connection is referred to as the optic nerve head and is visible when looking into the

eye using an ophthalmoscope. The optic nerve head is approximately 1.8 mm (0.07 in) in diameter. Since there are no photoreceptors (rods or cones) overlying the optic nerve head, there is a small blind spot or "scotoma" of approximately 5° in size about 15° temporal to fixation in the visual field of each eye. When both eyes are open, the blind spot of each eye is "filled in" by the visual field of the other eye. The optic nerves of each eye continue posterior and then meet at the optic chiasm. It is here that axons of neurons from the nasal retina (temporal visual field) cross to the opposite or "contra lateral" optic tract (e.g. axons from the right eye temporal visual field cross to the optic tract on the left side of the brain). Axons of neurons from the temporal retina (nasal visual field) continue along the same side optic tract (same side of side of the visual field are traveling to the brain via the left optic tract and signals from the left visual field are traveling via the right optic tract the brain). This means that visual signals from the right. Each optic tract terminates at its LGN. If a stroke, aneurism or tumor causes damage along the visual pathway, it is often possible to diagnose the exact location of the insult by measuring the visual field. For instance, a pituitary tumor would appear near the optic chiasm and the impact on the visual field would be on the fibers that are crossing to the other side of the brain. Since these fibers are from the nasal retina of each eye, the loss of vision would be in both temporal visual fields defect. whereas an insult to one of the optic tracts would result in a loss of vision to the opposite or contra lateral side of the visual field. For instance, a defect to the right optic tract would cause a loss of the left visual field of both eye The visual cortex in the occipital lobe of the brain is where the final processing of the neural signals from the retina takes place and "vision" occurs. The occipital lobe is at the most posterior portion of the brain. There are a total of six separate areas in the visual cortex, known as the V1, V2, V3, V3a, V4 and V5. The

primary visual cortex or V1 is the first structure in the vi sual cortex where the neurons from the LGN synapse. In V1, the neural signals are interpreted in terms of visual space, including the form, color and orientation of objects. (Corina van de Pol2010)

### 2.1.4.Ultrasound Physical:

The effective use of ophthalmic ultrasound requires a basic knowledge of its physical nature and the phenomena associated with its propagation and scattering. This understanding is important for proper interpretation of clinical results and avoidance of misleading artifacts that can arise in ocular examinations. It is also important for evaluating emerging techniques that promise to extend the scope of ultrasonic examinations in the future as well as to best use other techniques for complementary diagnostic value. Ultrasound is a high-frequency acoustic wave using frequencies outside the normal hearing range (20 Hz to 20 kHz). Most ophthalmic equipment is set at(8MHz)or higher. This contrasts with ultrasound equipment used for general surgery or obstetrics that works at (5–6 MHz) allowing a greater depth of tissue penetration but reduced resolution. Probes generating frequencies up to( 20 MHz) and, in the case of (UBM), up to (50 MHz) are now also used in ophthalmology. These allow resolution of very small structures. The probe contains quartz or ceramic crystals (usually lead zirconate titanate) that vibrate when a voltage is applied, generating a sound wave of constant frequency and amplitude. This is known as the piezoelectric effect. The higher the frequency, the shallower is the depth of tissue penetration. Increasing the energy of the wave will increase penetration but will increase heat generation.( Cathy W Dibernardo … et al 2007)

#### 2.1.4.1.A -scan:

A-scan is a one-dimensional display of echo strength over time. Vertical spikes correspond to echo intensity and are shown on the horizontal axis as a function of time. There are two primary types of A-scan used in ophthalmic ultrasonography; biometric A-scan and standardized diagnostic A-scan. Each has slightly different operating frequencies and amplification algorithms. Biometric A-scan is optimized for axial eye length measurements. It utilizes a probe with an operating frequency of (10–12MHz) and a linear amplification curve. The sound velocity in ocular structures along the visual axis at physiological temperatures is well established resulting in highly accurate measurements. The primary function of biometric A-scan in ophthalmology is to determine the axial eye lengths (AEL) for patients undergoing cataract surgery so that the dipodic power of the intraocular lens (IOL) to be implanted can be accurately determined. (Muna Bhende… ect 2013)

### 2.1.4.2.B-scan

Contact B-scan is a two-dimensional display of echoes using both the horizontal and vertical orientations to show shape, location and extent. Dots on the screen represent echoes and the strength of the echo is determined by the brightness of the dot. Most ophthalmic ultrasound machines utilize logarithmic or S-shaped amplification and a frequency in the range of (10 MHz). The term contact refers to the direct application of the probe to the surface of the eye with methylcellulose as a coupling agent in the absence of a water bath B-scan images are highly accurate representations of ocular structures and provide the foundation for diagnostic ultrasound in ophthalmology. Evaluation and differentiation of intraocular lesions is one of the primary indications for ophthalmic ultrasonography. Contact B-scan is most informative regarding topographic features including the location, shape, and extension of the

lesion. It is important to note that the evaluation of static B-scan images in isolation can lead to misdiagnosis. B-scan evaluation is a dynamic process requiring specific attention to the mobility of the displayed echoes. Standardized echography, the combined use of contact B-scan and standardized A-scan, provides a reliable method to evaluate ocular lesions based on the top graphic, quantitative and kinetic properties of the echo amplitudes and patterns. These methods are well established, most extensively for choroidal melanoma, and used in clinical trials for the documentation of tumor differentiation and growth. B-scan probes have a marker along the side of the probe close to the probe tip that indicates the top of the B-scan ultrasound display . The transducer inside the B-scan probe oscillates along the plane of the marker only, towards the marker and away from the marker. Therefore, the top of the B-scan display corresponds to the area indicated on the marker and the bottom of the display corresponds to the plane (180°) away from the marker. The probe tip corresponds to the white line on the far left side of the B-scan display.( Muna Bhende… ect 2013)

### 2. 1. 5. Pathology:

### 2. 1. 5.1. Conjunctiva and cornea:

Adenoviruses type 3 and 7 cause a conjunctivitis in which there is hyperplasia of lymphoid tissue in edematous and hyperemic conjunctivitis. Epidemic conjunctivitis is due to adenovirus type of infection. The cornea is involved particularly in herpes simplex infection, epithelium being destroyed in a finger like or dendrites pattern. Herpes simplex keratitis is often recurrent and corneal transparency is destroyed by stromal fibrosis and in growth of blood vessels accompanied by inflammatory cells. Dissolution of corneal stroma is aggravated by the release of the

colagenases from leucocytes and the damaged corneal cells. When scarring occurs the central cornea can be replaced by a homotransplant. (PK Srivastava…. et al 2007)

### 2. 1. 5.2. Trachoma or TRIC infection:

Infection caused by chlamydia trachomatous of types A, B and C is common in the tropical zones and trachoma is responsible for blindnesson amassive scale. The organism initially infects the conjunctiva epithelium and it can be demonstrated in smears of these cells by the presence of characteristic intra-cytoplasmic inclusion bodies. The conjunctiva is thickened by a dense lymphocytic infiltrate which commonly extends on to and destroy the superficial peripheral cornea. The healing stage is associated with conjunctival scarring, eyelid distortion and corneal damage by inturned lashes. **(**PK Srivastava **….**et al 2007**)**

### 2. 1. 5.3.Uveal tract:

In tuberculosis, syphilis and brucellosis the uveal tract (the iris, ciliary body and choroid) is the normal location of the granulomatous uveitis. A chronic inflammatory process in the choroids (choroiditis) leads to focal destruction of the pigment epithelium and the adjacent retina, which either fuses with the choroid or is detached by leakage of fluid from blood vessels (exudative detachment). In the iris (iritis) and ciliary body (cystitis), stromal infiltrationby lymphocytes and macro- phages leads to exudation of protein into the anterior and posterior cha-mbers , clumps of inflammatory cells adhering to the posterior corneal surface (keraticpreciptates) are a classical sign of iridocyclitis. (HV Nema … et al 2009 )

### 2. 1. 5.4. Retinitis:

Is the most important component of infection due to herpes and cytomegalovirus in AIDS and the retina in the site of attack in toxoplasmosis and toxocariasis. In drug addicts, fungal infection spreads from the retina into the vitreous, autoimmune reaction occurs in the eye in two established disease entities, lens-induced uveitis and sympathetic ophthalmitis. The eye may be involved in all the connective tissue disease, but the disastrous effects of destruction of collagen in the sclera (scleromalacia)and cornea are noteworthy in rheumatoid arthritis. (HV Nema … et al 2009 )

### 2. 1. 5.5. Vitreous Hemorrhage:

Vitreous hemorrhage spreads diffusely in the gelatinous vitreous, obscuring the optic disk, and does not form a fluid meniscus unless the bleeding is in the space around the vitreous. The causes of vitreous hemorrhage include vitreous detachment, diabetic retinopathy, retinal microaneurysm, trauma, and vascular tumors. The patient complains of black rain" and has reduced visual acuity. The hemorrhage is absorbed slowly, and the clinical course depends on the exact cause. If choroid tumors are large or near the optic disk, enucleation of the eye is sometimes necessary. However, brachytherapy that is, radiation plaques placed outside the sclera adjacent to the tumor is the preferred mode of treatment.**(**PK Srivastava …et al 2007)

### 2. 1. 5.6. Cataract:

The biconvex lens substance is formed by cells which contain crystalline lens proteins. The cells are enclosed in a clastic membrane, the lens

capsule, the malleability of the lens permits rapid fine focusing by tension exerted on the lens equator by the ciliary muscle via the zonularfibers, As there is a constant production of new lens fibers at the periphery of the cortex during life, any change in the biochemical composition of the aqueous fluid may result in formation of abnormal (opaque) proteins in the damaged lens cells, thus opacities may occur after the trauma, in uveitis and in metabolic disease. The most common form of cataract, however, is senile cataract which is due to degradation of lens proteins in the oldest central part of the lens, yellow and eventually dark brown proteins are formed. Most cases of cataract are treated successfully by removal of the opaque lens matter and the insertion of a plastic lens implant into the residue of the lens capsule. (HV Nema …et al 2009 )

### 2. 1. 5.7.Glaucoma:

Glaucoma is generic name for group diseases in which, for a variety of reasons, the intraocular pressure increases to a level which impairs the vascular perfusion of the neurological disease and causes blindness. The rise in pressure is due to obstruction so the outflow of aqueous, which occurs either as the result of closure of the chamber angle or as the result of an abnormality within the outflow system. (HV Nema2009 )

### 2. 1. 5.8. Asteroid Hyalosis:

Asteroid hyalosis, aunilateral condition characterized by formation of calcium soaps within the vitreous cavity, appears as bright round signals on B-scan, and medium amplitude spikes in A-scan, with an echo free space just in front of the retina that represents the echo free vitreous gel (Fig 7.). This is in contrast to an eye with emulsified silicone oil, where there is no echo-free space. Generally, these opacities exhibit distinct movement on movement of the eye. (HV Nema… et al 2009 )

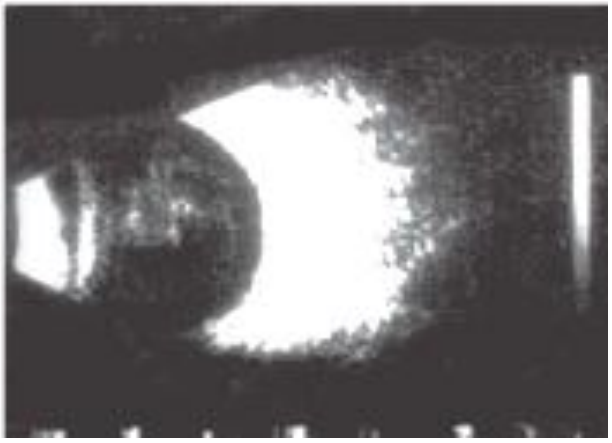

**Figure 2.6:** show B scane patient Asteroid hyalosis (HV Nema… et al 2009)

### 2. 1. 5.9. Posterior Vitreous Detachment*:*

Posterior vitreous detachment (PVD) appears as an undulating membrane in front of the retinochoroidal layer that moves with movement of the eye. It may separate completely from the posterior pole or may remain attached to the optic disk. PVD may be complete or incomplete. It is incomplete in most of the vascular retinopathies associated with vitreous hemorrhage, particularly proliferative diabetic retinopath(PDR).(Cathy W Dibernardo … et al 2007)

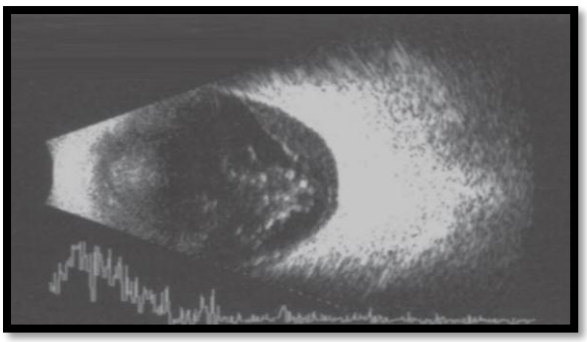

**Figure 2.7** : Patient with PDR and VH. Blood is present both in the central vitreous (Cathy W Dibernardo … et al 2007)

### 2. 1. 5.10. Vitreous floaters

Appear as one or more echo dots of less brightness in the mid posterior vitreous cavity which show mobility with after movement display on

Bscan. These may be associated with enlarged globe size. (Cathy W Dibernardo … et al 2007)

### 2. 1. 5.11. Retinal Detachment

Retina is closely applied to choroid. It is firmly attached at optic nerve head and oraserrata. Retinal detachment (RD) typically produces a bright continuous normally folded membrane on 'B- scan. It is usually attached at optic nerve head and oraserrata giving a funnel shaped appearance. The RD shows little or more restricted movement than posterior vitreous detachment. Extensive detachment may present as funnel shaped membrane, which may be open or close type. Long-standing retinal detachment may develop retinal cyst. It may be partially calcified and cholesterol debris may accumulate in subretinal. Three main type of retinal detachments are seen. Rhegmatogeneous retinal detachment*:* It is caused due to the brake in the continuity of retina due to the weakness in the peripheral retina due to degeneration as in myopia, diabetic retinopathy or vitreoretinal traction in detached vitreous. Nonrhegmatogeneous *retinal detachment:* It is further divided into two types Tractional RD is caused due to fraction of detached vitreous pulling the retina from the pigmented epithelium through vitreo-retinal bands resulting into angular or fix retinal detachment. Exudative retinal detachmentIt is caused due to collection of fluid in the subvitreal space due to inflammation-uveal effusion or tumors. Exudative retinal detachment (Coats' disease). Coats disease is a unilateral condition mainly found in children. Usually present in first decade of life. It is more common in males than females. It is to be differentiated from retinoblastoma, retinopathy of prematurity.( Cathy W Dibernardo … et al 2007

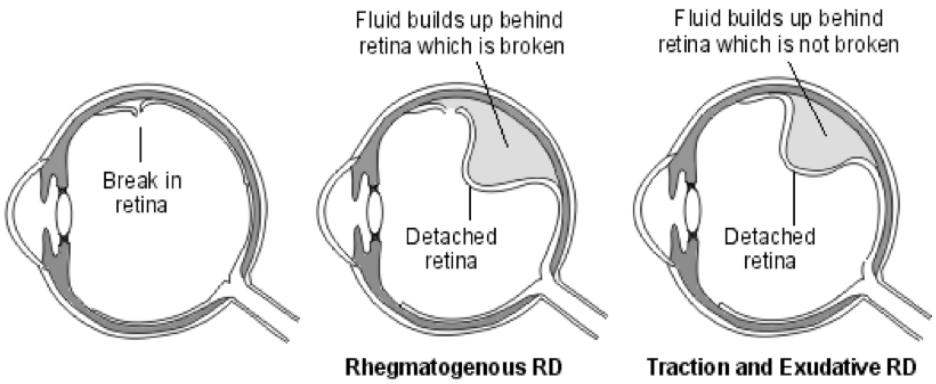


**Figure 2.8** diaphragm of three type of Retinal detachment (Timothy Roo.2010

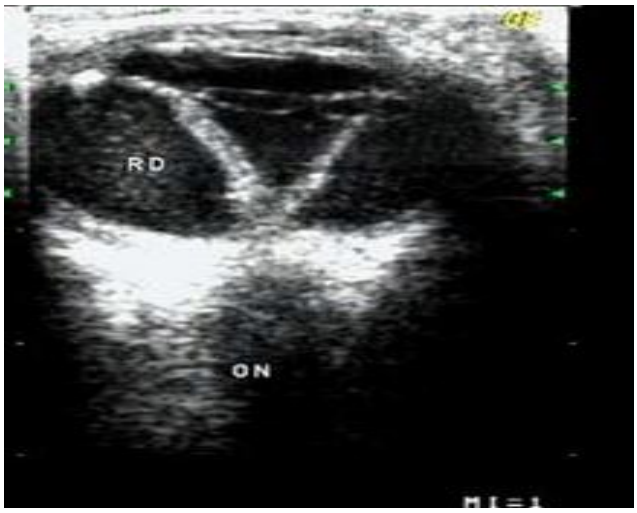


**Figure 2.9 :** Atypical'V'shaped echogenic membrane in the posterior segment of the eye. This 'V' shape is due to insertion of the retina at optic nerve and oraserrata.( *PK Srivastava* ..et al 2007)

## 2. 1. 5.11. Retinal Tear:

Large retinal tears can be visualized easily, but the smaller ones require a meticulous examination. It appears as a breach of tissue on B-scan, and on A-scan it appears as a highly reflective tissue separate from the other fundus spikes Giant retinal break with detachment appears as a rolled out tissue on B-scan with clear breach of tissue. In general, however, detecting retinal tears on ultrasonography is not easy and it is never as specific or

sensitive as on optical evaluation. It is useful in situations when fresh vitreous hemorrhage due to retinal tear obscures the fundus view; in these situations the retinal tears are mostly located in the upper half of the retina. **(**PK Srivastava …ect 2007)

### 2. 1. 5.12.Choroidal Detachment

On B-scan a choroidal detachment appears as a smooth, dome-shaped, thick membranous structure that does not insert to the optic nerve. The choroidal detachment can be localized, or involve the entire fundus (*kissing choroidal detachment*). The B-scan also can demonstrate the nature of suprachoroidal fluid; in serous detachment, the suprachoroidal space is echolucent, and in hemorrhagic detachment, the suprachoroidal space is echodense. On A-scan the thickened choroid appears as a series of high reflective spikes just behind the retinal spike. The detached choroid produces (100%)reflective, double peaked spike (retina and choroid together). This spike exhibits little or no after movement on kinetic scanning .The suprachoroidal space appears with low to medium height spikes depending on the nature of suprachoroidal fluid. ( Cathy W Dibernardo … et al 2007)

### 2. 1. 5.13. Diabetic retinopathy:

Diabetes can damage the small blood vessels in the retina.Blood vessels of retina can break down, leak, or become blocked affecting oxygen and nutrient delivery to the retina impairing vision over time. More damage to the retina can occur when abnormal new blood vessels grow on the surface of the retina and leak fluid or bleed. This can result in blurring of vision initially and in late stages, retinal detachment and/or glaucoma may develop. Untreated diabetic retinopathy progresses through four stages Mild non-proliferative, diabetic retinopathy ,Moderate non-proliferative

diabetic retinopathy and Severe nonpro- liferative diabetic retinopathy. Non-proliferative diabetic retinopathy (NPDR): is the early stage of this disease. Small blood vessels bulge in mild NPDR, followed by blood vessel blockage in moderate NPDR, and greater vessel blockage and loss of blood supply in severe NPDR. Proliferative diabetic retinopathy (PDR): The most advanced stage of diabetic retinopathy is (PDR). It is marked by the growth of new, fragile, abnormal blood vessels on the retina or optic nerve. These blood vessels can leak blood into the eye and lead to severely blurred vision. This bleeding may cause dark spots (floaters), strands that look like cobwebs, or clouded vision. The abnormal blood vessels can scar and contract, sometimes pulling the retina away from the back of the eye, causing a retinal detachment. This may result in loss of vision or even blindness if it is not treated in a timely manner If abnormal new blood vessels block the normal flow of fluid out of the eye, pressure may build up in the eye.This can damage the nerve that carries information from the eye to the brain (optic nerve),resulting in glaucoma and possible vision loss.( Cathy W Dibernardo. . et al 2007**)**

### 2. 1. 5.14. Intraocular Foreign Body:

Ultrasonography can detect both metallic and non-metallic foreign bodies. Metallic foreign bodies produce very bright signals on B-scan that persist on lowering the gain When the sound beam is focused on the metallic foreign body, much of the sound waves are absorbed by the foreign body, thus creating a shadowing artifact on the adjacent orbit. Round metallic foreign bodies classically produce reverberation artifact just behind the foreign body, and the sound signals gradually reduce as it progresses to the orbit. On A-scan metallic foreign bodies produce high (100%) reflective echoes, and reduplication echoes are seen as progressively decreasing amplitude spikes behind the round metallic foreign body. Glass and

vegetative matter (radiolucent) are more challenging, but they also produce bright signals on B-scan, and tall reflective echo on A-scan. (HV Nema. . et al 2009)

### 2. 1. 5.15. Posterior Staphyloma:

Posterior staphyloma is seen as a shallow excavation of the posterior pole with smooth edges on sonographic evaluation of highly myopic eyes. Staphyloma involving the ciliary body is called ciliary or intercalary staphyloma depending on its location. It is caused by glaucoma and scleritis Anterior staphyloma develops secondary to infection, trauma or radiotherapy. It consists of ectatic pseudocornea (formed by fibrous tissue) lined by uveal tissue. (HV Nema . . et al 2009)

### 2. 1. 6. Previous studies:

In study done by David and Marie, London in (1999). A rapid B- scan technique was used to examine 176 eyes of the last 154 patients referred for ultrasonic evaluation because of sever diabetic eye disease of these patients (91)(59%) were female and 121 were over 40 Yrs, vitreous hemorrhage 53 (30%), posterior vitreous detachment 24(20%),Epiretinal fibrosis82(40%) and retinal detachment 17 (10%) could be diagnosed by ultrasonic examination. the prevalence presented in result that the proliferative retinopathy is one of the most serious complications of diabetic eye disease. Also the contraction of fibrous tissue resulted of retinal detachment and vitreous detachment was a crucial stage in progression of proliferative retinopathy to hemorrhage and retinal detachment. ( www.researchgate)

In study done by Eman Ahmed Osman National Ribat University 2017Assessment of Eye in Diabetic patient using Ultrasound study done

by 100 diabetic patients the females were more affected 63 (63%) than the male 37(37%) .US finding showed that most of the patients (25%) were diagnosed as vitreous and (19%) with retinal detachment which, also found vitreous hemorrhage (5%) posterior vitreous detachment (5%) and vitreous change + cataract (10%) .

Role of B-scan ocular ultrasound study done by Cejas C, Benavides. December 2012. 79 patients submitted to an ultrasound scan 17(21%) cataracts.12(13%) cases of Hemovitreous .5 (6%) Neoplastic lesions .8(7%) macular degenerations.4(5%)cases of congenital diseases.5(6%) inflammatory pathologies 16(20% )cases retinal detachments. 4( 5%) vitreous detachments .(www.myESR.org)

## 3. Material and methods

### 3.1 Patients:

In this study are 150 cases of diabetic patients selected randomly. Included the patients age between 25-abov 45yearse old , patients gender,duration of diabetes disease, Vision defect, type of diabetes ultrasonography finding and appearance, and final diagnosis.

### 3.1. 2 Patients area and duration:

This study was conducted at ultrasonography Department Mkaa, which was carried out during the period from October 2016 to May 2018.

### 3.1.3 Exclusion criteria:

Any individual who was traumatic patient .

### 3.2 .1 Ultrasound Machine:

Using a Nidek (Echoscan US-4000) ultrasonic unit, equipped with a high frequency direct contact 10 MHz transducer. , displayed on the 110×20cm Graphics Sony thermal printer. Initial examination was performed under high gain(80 dB to 100 dB) and low gain (60 dB to 70 dB) sensitivity for more detailed inspection during ultrasonography.

## 3.2 methods

### 3.2 .1 Ultrasound technique:

All sonographic examinations were performed in a sitting position in a thermally controlled room of (26 °C; 78 °F) by the same sonographer. The diagnostic B-mode was performed For efficient and accurate diagnosis of ultrasound images, the appropriate time gain compensation and dynamic range control of ultrasound echo signals were automatically set by the system and/or manually adjusted by the sonographer to obtain the desired image quality on the screen. Time gain compensation was used for commend sating the attenuation of ultrasound echo signals along the depth,

and the dynamic range adjusted was for controlling the image contrast resolution, i.e., To increase the ability to distinguish between different echo amplitudes of adjacent structures. Hydrochloride (0.5%) eye drops solution was used for local anesthesia and Aquasonic 100 Ultrasound Gel was applied as the coupling material. B-scans were performed with the patient lies in the Sitting position. The transverse probe position. The probe face is coated in ultrasound gel and positioned on the opposite conjunctival surface parallel to the limbus, regardless of probe location around the globe, with the marker aimed either superiorly or nasally. Consequently, the marker is oriented superiorly when examining the nasal or temporal globe (3 O'clock or 9 O'clock positions) and toward the nose when examining the superior or inferior globe (12 O'clock or 6 O'clock positions).

### 3.2 .2 Data collection tools:

The data was collected by using data collection sheet designed especially for the study.

### 3.2.3 Data analysis:

The data analyzed by using Statistic Package for Social sciences (SPSS) version 16 and used Pearson Correlation , then presented by figs, tables, chart and text.

### 3.2.4 Ethical clearance:

The procedures of the scanning with ultrasonography were explained to the patient and the purpose of incorporating their data in the study was acquired in case of agreement. permission from the hospital and the ultrasonography department.

### 3.2 .2 Interpretation

All image diagnostic by DR(Ali Aftab) Consultant ophthalmologist.

DR (Rem Alsnose) Consultant ophthalmologist

## 4. Result:

**Table (4.1) :**Distribution of patients according to gender

| Gender | Frequency | Percentage |
|---|---|---|
| Females | 90 | 60 % |
| Males | 60 | 40 % |
| Total | 150 | 100% |

**Table ( 4.2 ) :** Correlation between gender and Vision defect

| Correlations | | | |
|---|---|---|---|
| | | gender | Vision defect |
| gender | Pearson Correlation | .02 | .428** |
| | N | 150 | 150 |
| Vision defect | Pearson Correlation | .428** | .02 |

correlation between gender there are female (60%) less than male( 40%) show significant correlation (.02) .

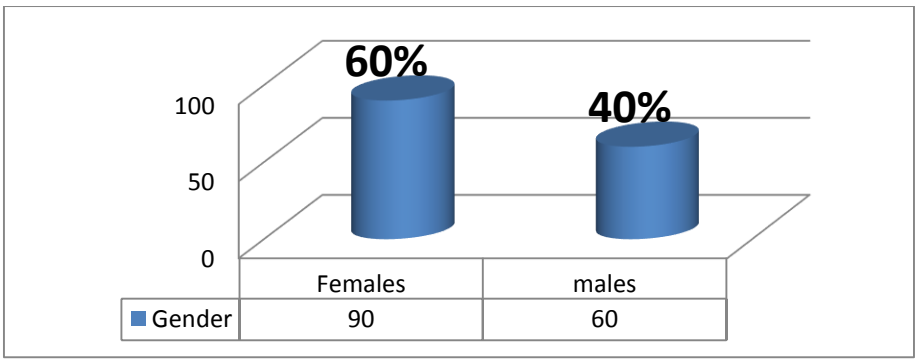


**Fig (4.1):** Distribution of patients according to gender

**Table (4.3):** Distribution of patients according to age

| Age (yrs) | Frequency | Percentage |
|---|---|---|

| | | |
|---|---|---|
| 25-29 | 7 | 5% |
| 30-35 | 9 | 6% |
| 36-40 | 15 | 10% |
| 41-45 | 34 | 23% |
| >45 | 85 | 57% |
| Total | 150 | 100% |

**Table (4.4):** Correlation between age and Duration of diseases

| Correlations | | | |
|---|---|---|---|
| | | Age | Duration |
| Age | Pearson Correlation | 0.01 | .552** |
| | N | 150 | 150 |
| Duration | Pearson Correlation | .552** | 0.01 |

high ratio is (6-10)years (27 %) give right answer, there was correlation between age there are high ratio ( > 40 ) (57%). show significant correlation (0.01).

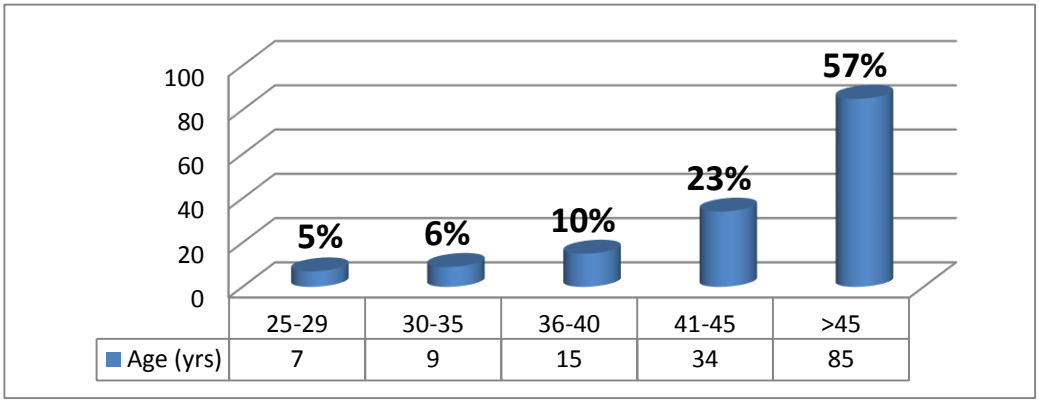


**Fig (4.2):** Distribution of patients according to age.

**Table(4.5):**Distribution of patients according to type of diabetes**:**

| Type | Frequency | Percentage |
|---|---|---|
| Type I | 47 | 31% |
| Type II | 103 | 68% |
| Total | 150 | 100% |

**Table(4.6):** Correlation between type of diabetes and U/S findings

| | | type of diabetes | findings |
|---|---|---|---|
| type of diabetes | Pearson Correlation | 0.1 | 1.001 |
| | Sig. (2-tailed) | | |
| | Sum of Squares and Cross-products | 45.00 | 45.000 |
| | N | 150 | 150 |
| Findings | Pearson Correlation | 1. 01 | 0.1 |
| | Sig. (2-tailed) | | |
| | Sum of Squares and Cross-products | 45.000 | 45.000 |
| | N | 150 | 150 |

correlation between images findings there are high ratio Retinal detachment.Show significant correlation at the (0.01) .

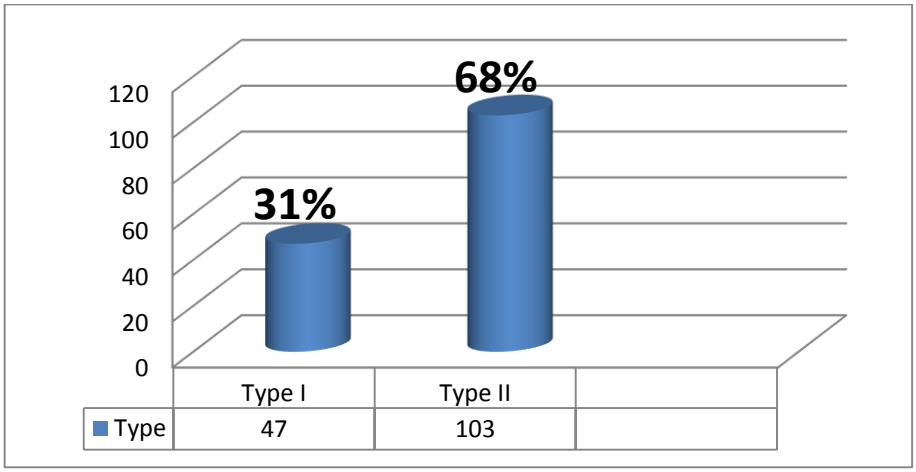


**Fig (4.3):** Distribution of patients according to type of diabetes

**Table(4.7**): Distribution of patients according to duration of the disease:

| Duration | Frequency | Percentage |
|---|---|---|
| (1-5 yrs) | 18 | 12% |
| (6-10 yrs) | 41 | 27% |
| (11-15 yrs) | 36 | 24% |
| (16-20 yrs) | 37 | 25% |
| (20> yrs) | 18 | 12% |
| Total | 150 | 100% |

**Table(4.8):**Correlation between duration and U/S finding

| | | type of diabetes | findings |
|---|---|---|---|
| duration | Pearson Correlation | 0.01 | 1.001 |
| | Sig. (2-tailed) | | . |
| | Sum 2of Squares and Cross-products | 45.00 | 45.000 |
| | N | 150 | 150 |
| Finding | Pearson Correlation | 1.001 | 0.01 |
| | Sig. (2-tailed) | . | |
| | Sum of Squares and Cross-products | 45.000 | 450.000 |
| | N | 150 | 150 |

correlation between images findings there are high ratio Vitreous change . show significant correlation at the( 0.01) .

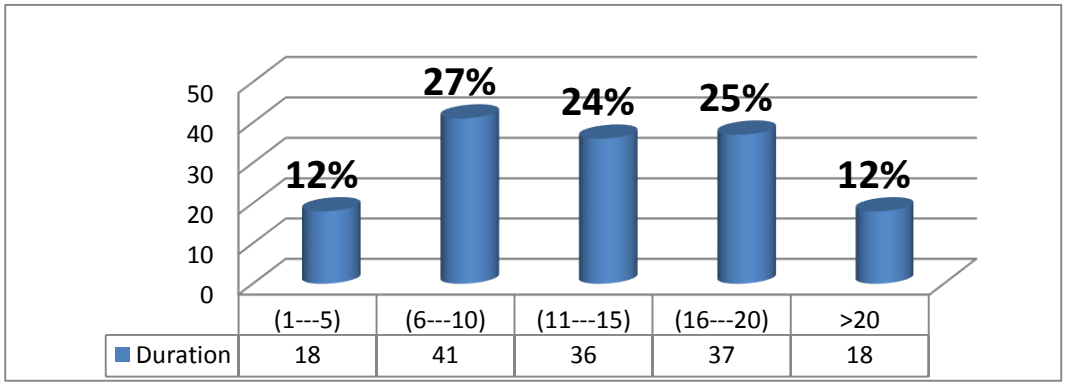


**Fig (4.4):** Distribution of patients according to duration of the disease.

**Table (4.9):** Distribution of patients according to vision defect**:**

| Vision defect | Frequency | Percentage |
|---|---|---|
| floater | 45 | 30% |
| flashing lights | 72 | 48% |
| Dark shadow | 5 | 3% |
| Blurring vision | 28 | 19% |
| Total | 150 | 100% |

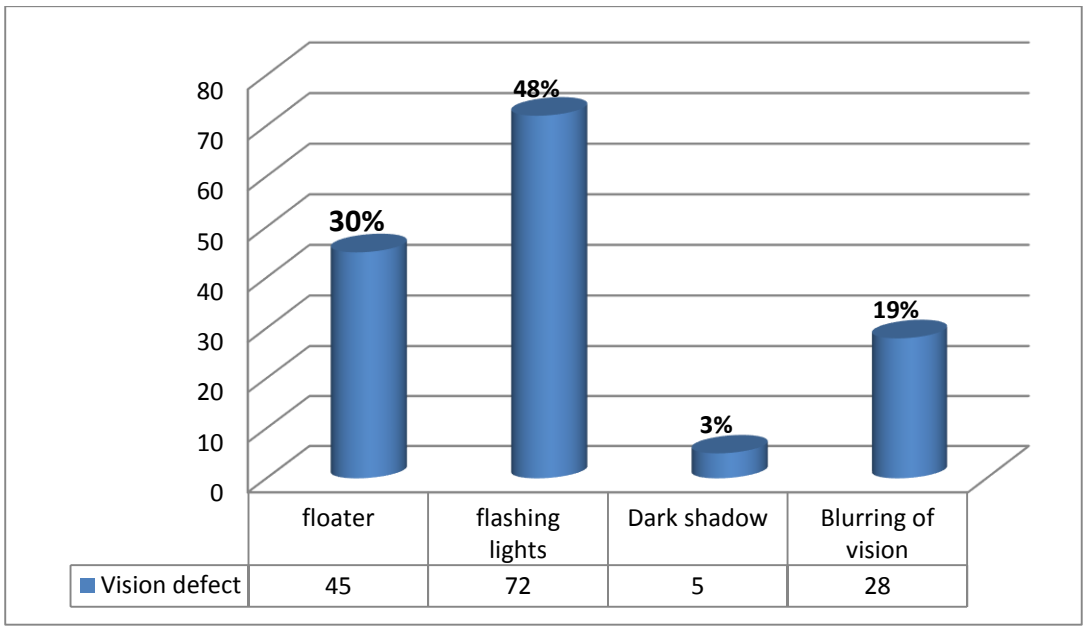


**Fig (4.5):** Distribution of patients according to Vision defect

**Table (4.10):** Distribution of patients according to pathology and U/S findings

| **Findings +pathology** | **Frequency** | **Percentage** |
|---|---|---|
| Cataract +Normal U/S | 21 | 14% |
| Vitreous change(Epiretinal fibrosis)+ Cataract | 12 | 8% |
| Cataract+ Retinal detachment | 7 | 5% |
| Cataract + silicon | 5 | 3% |
| PVD+ Cataract | 12 | 8% |
| Diabetic retinopathy +VH | 9 | 6% |
| Diabetic retinopathy +VH+RD | 11 | 5% |
| Myopic + Retinal detachment | 4 | 3% |
| Myopic + vitreous Hemorrhage | 8 | 5% |
| Glaucoma+ Normal U/S | 17 | 11% |
| Glaucoma + Retinal detachment | 10 | 7% |
| Glaucoma + vitreous change | 7 | 5% |
| Glaucoma +PVD+vitreous change | 12 | 8% |
| Retinal detachment | 15 | 10% |
| Total | 150 | 100% |

**Table(4.11)** Correlation between Vision defect and Finding& pathology

| | **Correlation** | **Vision defect** | **Findings** |
|---|---|---|---|
| **Vision defect** | Pearson Correlation | **.05** | .412 |
| | Sum of Squares and Cross-products | 45.00 | 45.000 |
| | N | 150 | 150 |
| **Finding& pathology** | Pearson Correlation | .412 | **.05** |
| | | . | |
| | Sum of Squares and Cross-products | 45.000 | 45.000 |
| | N | 150 | 150 |

Distribution of patients according to Vision defect is flashing lights (48%) give right answer there was correlation between images findings there are high ratio Cataract +Normal U/S (15%). show significant correlation at the (.05 )

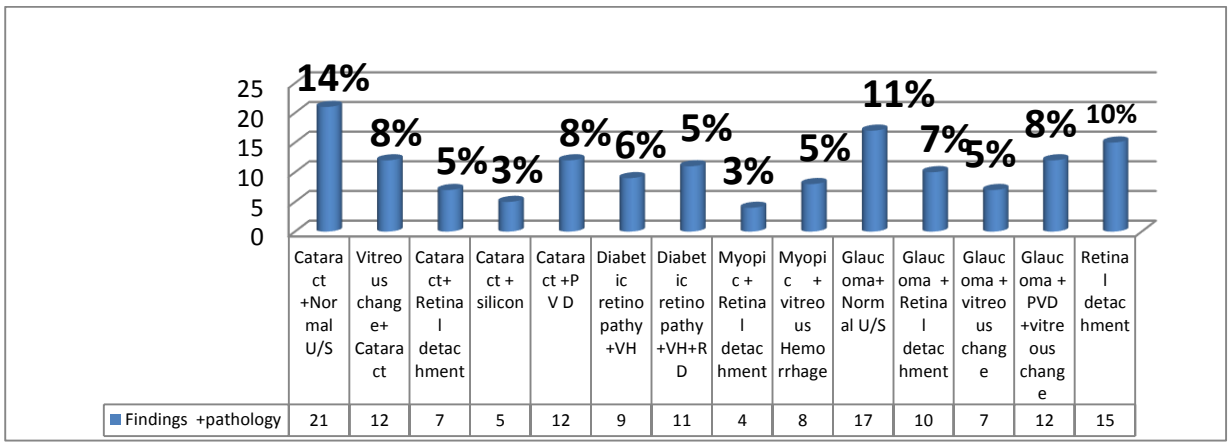


**Fig (4.7):** Distribution of patients according to pathology and US findings

## 5.1 Discussion:

A cross sectional descriptive study done on 150 diabetic patients to evaluate the role of U/S in ophthalmic pathology of diabetic patients which is the main objective of this study.

The study found in that the (60%) females were more affected than the (40%) males which mentioned with study done by (David..et al (1999 ) (and agree also with (Eman Ahmed (2017). Table (4.1)

When comparing the gender and the vision defect of patient underwent the study, it was found that there was a highly significant relation between them p. value (.02) Table ( 4.2 )

The most affected age group were elderly patients above (45 yrs) (57%) and this result agree with (David..et al (1999) Table (4.3).Patients age(41-45yrs)(23%) Patients age(36-40yrs)( 10%) than Patients age(30-35 yrs) (6%)and Patients age(25-29 yrs) (5%) Table (4.3).

The study found that in Diabetic patients( type 1) (31%) and (type II) ( 63%) high frequency this result agree with the (Eman Ahmed Osman (2017) . Table (4.5).

The study found that there was a highly significant relation between type of Diabetic and sonographer finding p. value (.01). Table (4.6)

Found a highly incidence of eye problems Cataract Diabetic- retinopathy, Retinal detachment, Posterior vitreous detachment ,Glaucoma ,Myopic, Vitreous Hemorrhage ,Epiretinal fibrosis and between them and the of type of diabetic. According of duration of disease we found that most affected group (6-10 yrs) 41 (27%) which mentioned with study done by (EmanOsman2017) .Than group(11-20yrs)(25%),than group(11-15 years) ( 24%) ,Than group (1-5 years)and ( >20 yrs) same ratio (12%). Table (4.7).

A Correlation don between duration of disease and age of patient the study, it was found that there was a highly significant relation between them p. value (0.01). Table (4.8)

A calling examination of patient (48%) Patients complaining flashing lights. floater vision (30%),than blurring vision(19%) and dark shadow (3% )patients. Table (4.9)

According to pathology and U/S findings high-frequency Cataract with Normal U/S finding (14%) which mentioned with study done by (Cejas..et al 2012). Cataract (Vitreous change U/S finding) (8%), Cataract (PVD U/S finding) (8%), Cataract( Retinal detachment U/S finding )(5%) and Cataract (U/S finding silicon)(3%) Table (4.10)

Glaucoma (Normal U/S finding)(11%),Glaucoma (PVD+ vitreous change U/S finding)(8%),Glaucoma ( Retinal detachment U/S finding) (7%) and Glaucoma ( vitreous change U/S finding )(5%). not mentioned with Previous studies. Table (4.10).

Diabetic retinopathy(vitreous Hemorrhage U/S finding) (6%) and Diabetic retinopathy(vitreousHemorrhage +RD U/S finding )( 5% ) not agree with Previous studies .Table (4.10)

Myopic (vitreous Hemorrhage U/S finding) (5%)and Myopic( Retinal detachment U/S finding)(3%).and Retinal detachment 10%) which mentioned with study done by (David..et al (1999 ) Table (4.10)

The study found that there was a highly significant relation between Vision defect and Finding& pathology between them p. value(.05) Table (4.11)

## 5.2. Conclusion:

- Ocular ultrasonography is the effective method of diagnosing the diabetic eye diseases.
- The study found that the females were more affected than males.
- The older patients were the most affected. The stduy found that most of pathological condition occure in diapatic patient in dected by ultrasonography were vitreous changes, vitreous hemorrhage, retinal detachment and posterior vitreous detachment.
- The long standing diabetis mellitus related strongly to the retinal detachment.
- The study concluded that the ultrasonography can be able to image the interior of ocular structures and therefore can diagnose any pathological change occuring due to different disease.
- There was a significat correlation between age duration of disease and abnormalities dibatic by ultrasonography respectiulay.
- Ocular ultrasonography in comparing with others medical imaging modalities such as , computed tomography (C T ) or Magnetic Resonance Imaging (M R I ) , is considered the modality , of choice and first line of investigation , because of the Ultrasound is quick , accurate ,noninvasive , cheap and available tool

## 5.3. Recommendations:

With reference to the result and conclusion, this study recommends the following:

The use of 3D Ultrasound in cases there is no ophthalmoscopy view into the eye .

The use of high resolution technique (20Mhz) B-scan in more mode to masure the intraocular tumors , and Doppler Ultrasound

Ocular ultrasonography must be available in all eye diagnostic centers.

A well knowledged and trained sonographers should perform the ocular ultrasound.

Detailed information about ocular ultrasonography must be available to the medical field participants.

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## Appendix (1)

## Assessment of eye in diabetic patient using ultrasound

## Data Collection Sheet (Questionnaire)

**Date:**

**Gender:**

a) Male ☐ b) Female ☐

**Age (yrs):**

a)20-25 ☐ b) 25-30 ☐ b)30-35 ☐ c) 35-40 ☐ d)>45 ☐

**Type of diabetes:**

a )Type ( I ) ☐ b)Type ( II ) ☐

**Duration (yrs):**

a)1-5 ☐ b)6-10 ☐ c)11-15 ☐ d)16-20 ☐ f)>20 ☐

**Patient history association**:

a) Hypertension b) Trauma ☐ d) maopic ☐ d) No ☐

8-**Vision defect:**

a) floater ☐ b) flashing lights ☐ c) Dark shadow ☐ d) Blurring of vision ☐

10- **Ultrasound finding: appearance**:

a) Vitreous hemorrhage ☐ b) Vitreous detachment ☐

c) Retinal detachment ☐ d) Vitreous change(Epiretinal ☐

☐ fibrosis e e) ☐rmal

U/S ☐) Others

11- **Pathology**

a) Cataract ☐ b) Diabetic retinopathy ☐ Glaucoma ☐

e) Retinal detachment ☐

12-**Final diagnosis**: ☐

## Appendix (2)

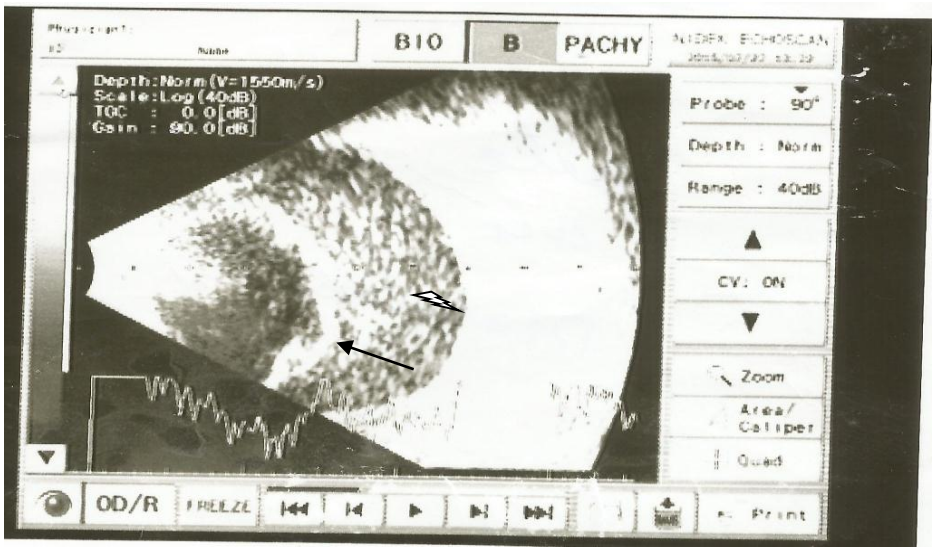


**Fig (1):** Right B scan images examining the nasal globe transverse scanning (12 O'clock) Patient 45 year old female shows vitreous hemorrhage. The high indicating organized blood (arrow) high reflectivity is a retinal detachment (arrowhead).

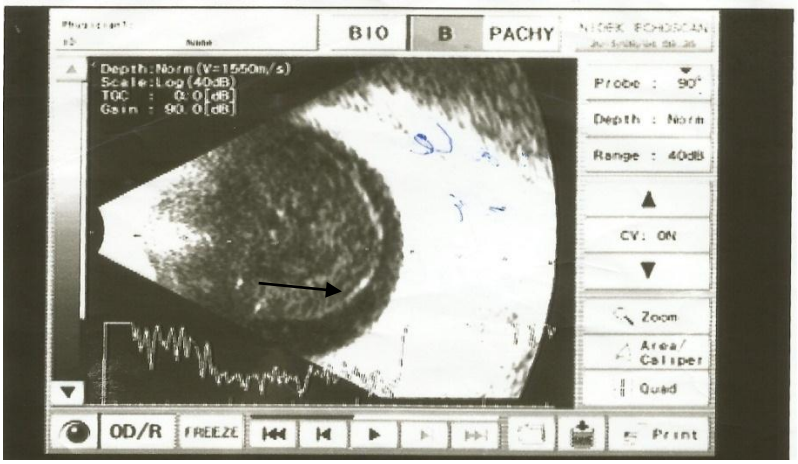


**Fig (2**): Right B scan images transverse axial (6 O'clock) technique shows Patient 50 year old male with PDR and vitreous hemorrhage (VH) Blood is present both in the central vitreous and Posterior Vitreous Detachment (PVD) arrow

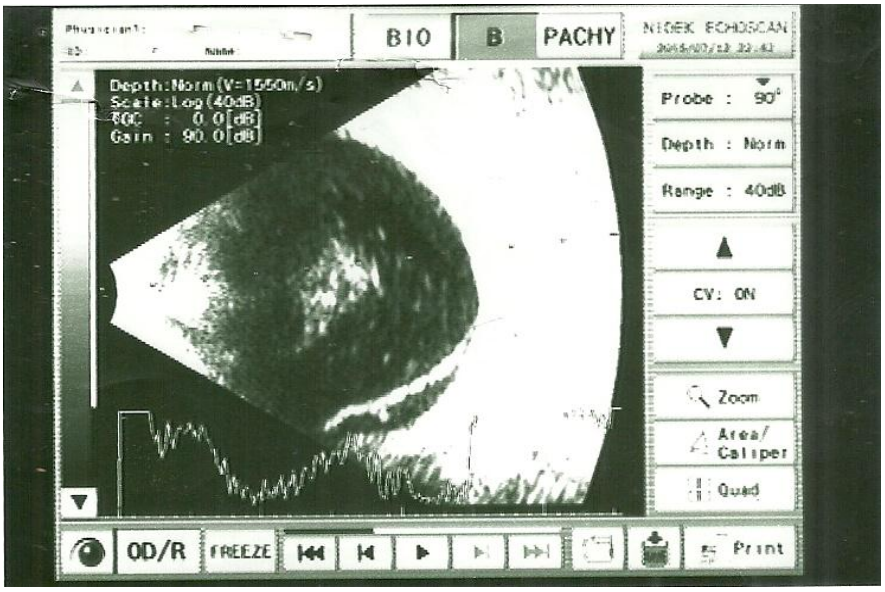


**Fig (3):** B scan images of the right eye of Longitudinal scanning (12 O'clock) patient (37 year old) female who presented with a painful decrease in vision for 3 months. Partial retinal detachment

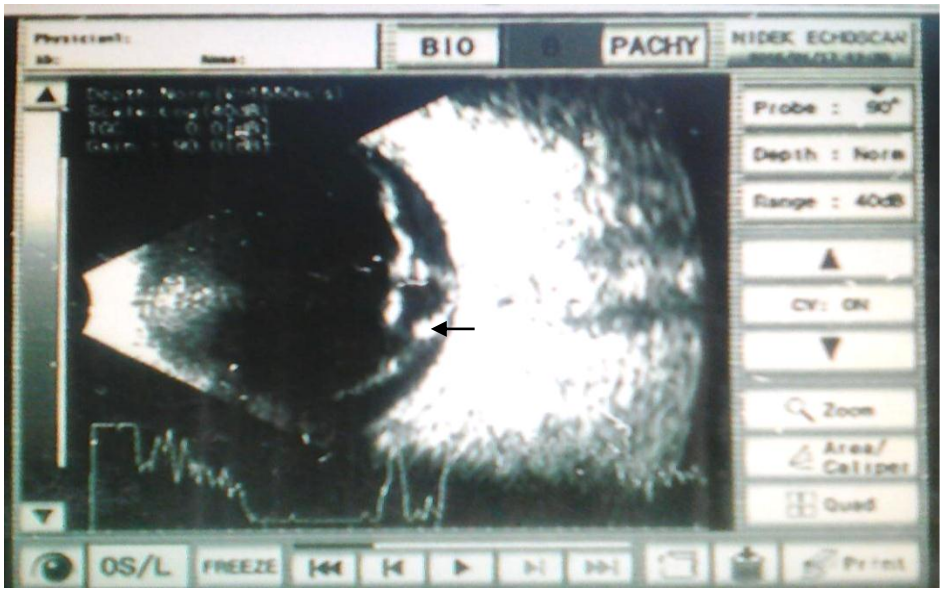


**Fig (4):** B scan images nasal globe transverse scanning (6 O'clock) of the Left eye of (43 year old) meal who presented with a painful decrease in vision for 3 months showing a high reflective smooth membrane

attached to the optic disc (arrow). The features are typical Total retinal detachment