



Original Article

Role of B Scan for Evaluation of Choroidal Disease

Dr Tara¹, Dr Rajesh Kumar Saini², Dr Supyar³, Dr Namrta Kumari⁴, Dr Shweta Gurjar⁵

¹Senior resident, Ophthalmology, Dr. SN Medical College, Jodhpur

²Associate Professor, Ophthalmology, JLN Medical College, Ajmer

³Senior resident, Ophthalmology, Govt. Medical College, Nagaur

⁴Medical Officer (Ophthalmology) District Hospital Anupgarh, Shri Ganganagar,

⁵Medical Officer (Ophthalmology) Sub district Hospital Khandar, Sawai Madhopur

 OPEN ACCESS

Corresponding Author:

Dr Rajesh Kumar Saini

Associate Professor,
Ophthalmology, JLN Medical
College, Ajmer

Email: raj_saini_2005@yahoo.com /
tararar6@gmail.com

Received: 20-02-2026

Accepted: 03-03-2026

Available online: 12-03-2026

Copyright© International Journal of
Medical and Pharmaceutical Research

ABSTRACT

B-scan ultrasonography is an important diagnostic modality in ophthalmology for evaluation of posterior segment pathologies particularly when visualization of the fundus is obscured by opaque media. Choroidal diseases include detachments, tumors, and inflammatory conditions that may lead to significant visual morbidity if not diagnosed early. B-scan provides real-time cross-sectional imaging and plays a vital role in diagnosis and differentiation of diseases.

Aim: To evaluate the role of B-scan ultrasonography in diagnosing of choroidal diseases in patients with and without opaque media.

Material and Methods: A hospital-based observational cross-sectional study was conducted in the Department of Ophthalmology, JLN Medical College and Associated Hospitals, Ajmer, Rajasthan, from March 2024 to March 2025. Thirty patients of all age groups with suspected choroidal pathology were included after informed consent. Patients underwent detailed clinical evaluation followed by B-scan ultrasonography using a standard ultrasound unit. Data were analyzed using descriptive statistics and expressed as percentages and proportions.

Results: The mean age of patients was 51.0 ± 21.23 years, with maximum cases in the 30–60 years age group (46.67%). Males constituted 76.67% of cases and 70% cases belonged to rural areas. Ocular trauma was the most common predisposing factor (50%) followed by cataract surgery (13.33%). Low intraocular pressure (<10 mmHg) was observed in 76.67% of patients. Choroidal detachment was the most common lesion detected (90%) while choroidal masses accounted for 10% of cases. The most common diagnosis was choroidal detachment (40%), followed by choroidal detachment with retinal detachment (16.67%), choroidal detachment with retinal detachment and vitreous hemorrhage (13.33%), and choroidal tumors including melanoma (6.67%).

Conclusion: B-scan ultrasonography is a reliable and indispensable diagnostic tool for evaluation of choroidal diseases, particularly in eyes with opaque media. Choroidal detachment was the most common pathology and was frequently associated with hypotony, trauma, and postoperative states. B-scan effectively identified associated retinal and vitreous abnormalities as well as intraocular tumors.

Keywords: B-scan ultrasonography, choroidal disease, choroidal detachment, opaque media, posterior segment pathology.

INTRODUCTION

Ultrasound is an acoustic wave that consists of an oscillation of particles within a medium. Ultrasound was first used in ophthalmology in 1956 by the American ophthalmologists, Mundt and Hughes¹. B-scan was introduced in ophthalmic practice by Baum and Greenwood in 1958². B-scan provides cross sectional display of diseased tissues and is valuable in detecting unsuspected posterior segment diseases³. B-scan are manufactured with very high frequencies of about 10 million

oscillations per second, or 10 MHz. High-resolution ophthalmic B-scan probes (ultrasound biomicroscopy [UBM]) of 20 to 50 MHz that penetrate only about 5 to 10 mm into the eye for incredibly detailed resolution of the anterior segment have been manufactured⁴.

Serous choroidal detachment involves transudation of serum into the suprachoroidal space and exudation of serum, most frequently caused by inflammation. Eye trauma and corneal ulcers are frequent, and panretinal photocoagulation can also cause choroidal detachments⁵. Ciliochoroidal edema/detachment without evidence of intraocular surgery or trauma should be investigated for a neoplastic, vascular, or inflammatory cause^{6,7}. Chronic choroidal detachment can lead to maculopathy and globe phthisis. In hemorrhagic detachments, severe loss of vision to hand motion or worse is reported to be greater than 70%^{8,9}. On ultrasound, the detachment is smooth, dome shaped, and thick. Virtually no movement is seen with eye movement. When choroidal detachments are hemorrhagic rather than serous (as is commonly seen in traumatic situations), the subchoroidal space is filled with a multitude of dots in contrast to the echolucent subchoroidal space of a serous choroidal detachment¹⁰. Ultrasound has become invaluable in the diagnosis and follow-up evaluation of uveal malignant melanomas. This homogenous, highly cellular tumor results in low to medium internal reflectivity and regular internal structure. Larger melanomas produce significant internal sound attenuation, reflectivity is lower at the base of the tumor; this is referred to as acoustic hollowing¹¹. Choroidal metastases in comparison to choroidal melanomas, choroidal metastases (the most common of which are from breast and lung cancer¹²) are typically shallow lesions with moderate to high internal reflectivity. They may be associated with a retinal detachment. With A-scan [ultrasonography](#), hemangiomas show high internal reflectivity with no obvious [signal attenuation](#). This is the characteristic of choroidal hemangioma by [ultrasonography](#). With a B-scan, circumscribed choroidal hemangioma appears as a dome-shape mass with a smooth [surface](#). There is a hyperechoic signal of equal strength inside the mass.

Aims and objectives:

To determine finding in choroidal disease B-scan with and without opaque media.

Role of B Scan in various choroidal disease and its clinically presentation to correlate.

MATERIAL AND METHODS

Study area: This study was done to assess the B Scan role in choroidal disease with and without opaque media in patients who were attending outdoor and indoor facility at Department of Ophthalmology, JLN Medical College and associated group of hospitals, Ajmer (Raj). This is a tertiary care hospital in central Rajasthan covering regional area of Ajmer.

Study design: A hospital based, observational, cross-sectional study.

Study population: Patient with suspected choroidal pathology who were attending OPD/IPD service in Department of Ophthalmology, JLN Medical College an associated group of hospitals, Ajmer (Raj) were included.

Inclusion criteria:

- 1 Both sex
- 2 Any age group
- 3 Low IOP
- 4 Also in patients where ophthalmoscopy is not possible for fundus examination

Exclusion criteria:

1. Not willing to give consent for this study.

Study period: Data collection took about one year after taking approval from Research Review Board, Ethics Committee & recruitment of subjects i.e. from march 2024 to march 2025. Then it took about four months for data processing & analysis, writing report and thesis submission.

Sampling design: This cross-sectional, hospital-based study was conducted after Institutional Ethics Committee approval along with due permission of PHOD-Ophthalmology, work was carried out among patients who meet the selection criteria at the out or in-patient at Department of Ophthalmology, JLN Medical College and Hospital, Ajmer. All the patients were diagnosed with choroidal disease based on their clinical features and were evaluated for the same. After obtaining informed consent, the patients were evaluated and B-scan was done.

Study Procedure

Procedure and importance of ocular evaluation is explained to the patient and informed consent obtained. History regarding age, sex, occupation, address, chief complaints, history of presenting illness, relevant past medical and surgical history were noted. Pathology obscuring the visualization of posterior segment with ophthalmoscopy was identified after dilating the pupil. These patients with opaque media were subjected for evaluation of the Posterior segment using a standard Ultrasound unit - MARVEL B-scan, consisting of diagnostic B scan and A scan biometry.

Statistical Analysis:

The data so collected was entered into Microsoft Excel version 2010, statistically analyze and expressed as simple percentages and proportions. Data was represented in the form of tables and analyzed with the help of descriptive statistics.

Table 1 : Age wise distribution of study subjects

Age Range	No. of Patients	Percent	p value
< 10	1	3.33	0.006
10 - 30	5	16.67	
30 - 60	14	46.67	
> 60	10	33.33	
Total	30	100.00	
Mean+SD	51.0+21.23		

The study population consisted of 30 patients, with a mean age of 51.0 ± 21.23 years. The age distribution showed that the majority of patients (46.67%) fell within the 30-60 years age range, followed by those above 60 years (33.33%). The remaining patients were distributed among the younger age groups, with 16.67% between 10-30 years and 3.33% under 10 years. The calculated Chi-square value is 12.50, and the corresponding p-value is approximately 0.006.

Table 2 : Sex wise distribution of study subjects

Sex	No. of Patients	Percent	Chi square	p value
Male	23	76.67	8.54	0.0035
Female	7	23.33		
Total	30	100.00		

The study population consisted of 30 patients, with a significant majority being male (76.67%) and a smaller proportion being female (23.33%). This suggests a potential gender disparity in the condition being studied. So, the male-to-female ratio is approximately 3.29:1. The calculated Chi-square value is 8.54, and the corresponding p-value is approximately 0.0035.

Table 3: Residential area wise status in study subjects

Residential Status	No. of Patients	Percent	chi square	p value
Rural	21	70.00	4.80	0.028
Urban	9	30.00		
Total	30	100.00		

The study population consisted of 30 patients, with a majority residing in rural areas (70.00%). This suggests that choroidal disease may be more prevalent or diagnosed more frequently in rural populations. In contrast, 30.00% of patients resided in urban areas. The calculated Chi-square value is 4.8, and the corresponding p-value is approximately 0.028.

Table 4: Ocular history wise distribution of study subjects

Ocular History	No. of Patients	Percent	Chi square	p value
Injury	15	50.00	34.44	<0.001
Cataract surgery	4	13.33		
Malignancy	3	10.00		
Corneal tear repair	2	6.67		
Trabeculectomy surgery	2	6.67		
Pan Retinal Photocoagulation	1	3.33		
Penetrating Keratoplasty	1	3.33		
Pars Plana Vitrectomy	1	3.33		
Scleral buckling surgery	1	3.33		
Total	30	100.00		

The study population consisted of 30 patients with various ocular histories. The most common ocular history was injury, reported by 50% of patients, followed by cataract surgery (13.33%) and malignancy in 10% patients. Other notable ocular histories included corneal tear repair (6.67%), pan retinal photocoagulation (3.33%), and penetrating keratoplasty (3.33%). This distribution suggests that traumatic injuries are a significant factor in the patients' ocular histories. The calculated Chi-square value is 34.44, and the corresponding p-value is approximately < 0.001 .

Table 5: Intraocular pressure wise distribution of study subjects

Level (mmHg)	No. of Patients	Percent	Chi Square	P value
< 10	23	76.67	20.10	p<0.0001
10 - 20	4	13.33		
> 20	3	10.00		
Total	30	100.00		

The results showed that the majority of patients (76.67%) had IOP levels less than 10 mmHg, while 13.33% had IOP levels between 10-20 mmHg, and 10% had IOP levels greater than 20 mmHg. Chi square value was 20.10 and p value <0.0001 which was significant in our present study.

The findings suggest that B-scan may be more useful in evaluating choroidal disease in patients with lower IOP levels.

Table 6: TYPE OF LESION wise distribution in study subjects

Type of lesion	Number of patients	Percent
Detachment	27	90
Mass	3	10

The type of lesion detected in patients undergoing evaluation for choroidal disease was assessed. The results showed that the majority of patients (90%) had detachment, while a smaller proportion (10%) had a mass lesion. Chi-Square Value: 33.00 and the p-value is less than 0.001 which was significant in our study. The findings suggest that detachment is the most common type of lesion associated with choroidal disease.

Table 7: Diagnosis wise distribution of study subjects

Diagnosis	No. of Patients	Percent	Chi Square	p value
CD	12	40.00	27.01	P <0.001
CD with RD	5	16.67		
CD with RD with VH	4	13.33		
CD with VH	3	10.00		
CD with endophthalmitis	2	6.67		
Choroidal melanoma	2	6.67		
Choroidal nevi	1	3.33		
Suprachoroidal hemorrhage	1	3.33		
Total	30	100.00		

The study population consisted of 30 patients, with various diagnoses related to choroidal disease. The most common diagnosis was choroidal detachment (CD), reported by 40% of patients. Other notable diagnoses included CD with retinal detachment (RD) (16.67%), CD with RD and vitreous hemorrhage (VH) (13.33%), and CD with VH (10.00%). This distribution suggests that choroidal detachment is a prevalent condition in this patient population. The calculated Chi-square value is 27.01, and the corresponding p-value is approximately < 0.001.

DISCUSSION:

This cross-sectional study evaluated the role of B-scan ultrasonography in diagnosis of choroidal diseases in cases with and without opaque media. The findings corroborate the utility of B-scan in the identification of choroidal pathologies such as choroidal detachment (CD), choroidal masses, hemorrhages, and associated retinal pathologies. 30 patients were selected as the study participants at OPD/IPD in the Department of Ophthalmology, JLN Medical college; Ajmer (Raj.). Patients who were not fulfilling the inclusion criteria were excluded from the study.

In the present study, the majority of patients (46.67%) belonged to the 30–60 years age group, followed by those above 60 years (33.33%).

The 30–60 years age group likely represents the population with the highest exposure to risk factors contributing to choroidal pathology, such as: Occupational trauma (more common in working-age adults) post-surgical complications (e.g., cataract surgery or trabeculectomy) systemic.

The findings correlate with Agrawal et al. (2015) and Murty et al. (2015) reported a peak incidence of choroidal disease in the 5th and 6th decades.

In this study, male predominance was observed, with 76.67% of patients being male and only 23.33% female, resulting in a male-to-female ratio of approximately 3.29:1. The observed male predominance in choroidal disease can be attributed to several factors: Higher risk of trauma in males are due to more involved in outdoor occupations, physical labour, and risk-prone activities (farming, construction, etc.) especially in rural settings. Similar sex distribution was found in previous studied Agrawal et al. (2015) who reported a male-to-female ratio of 3.1:1 among patients with choroidal disease. Solanki

ND (2016) observed that 86.25% of ocular trauma cases occurred in males.

Murty CS et al. (2015) and Pujari A et al. (2017) also reported a similar male predominance in posterior segment pathologies detectable by B-scan.

Higher incidence of ocular trauma in rural areas: Individuals living in rural regions are more likely to be engaged in agricultural labour or manual work, increasing the risk of blunt trauma, foreign body injuries, and exposure to pathogens.

Similar previous studied Solanki ND (2016) and Joshi R et al. (2017) emphasized that rural males working in agriculture form the bulk of patients presenting with posterior segment pathologies due to trauma or infection.

Murty CS et al. (2015) and Chanchlani M et al. (2016) noted that B-scan is indispensable in rural settings, especially where dense cataracts or corneal opacities limit ophthalmoscopic evaluation.

Agrawal R et al. (2015) observed that rural patients often present late with vitreous hemorrhage or retinal detachment, conditions commonly associated with or mimicking choroidal disease on B-scan.

In this study of 30 patients with choroidal disease, 50% had a history of ocular trauma, making it the most common antecedent event. Other notable associations included cataract surgery (13.33%), ocular malignancy (10%), and various intraocular procedures such as trabeculectomy, pars plana vitrectomy (PPV), scleral buckling, and keratoplasty. The result was highly statistically significant ($p < 0.001$), affirming the strong link between past ocular history and development of choroidal pathology.

Ocular Trauma 50% is a major risk factor for choroidal detachment, suprachoroidal hemorrhage, and inflammatory sequelae involving the choroid. Blunt trauma can rupture choroidal vessels or induce hypotony, leading to serous or hemorrhagic choroidal detachment, especially in young males and rural laborers, which mirrors the study demographics.

Solanki ND (2016): Found trauma was the most common cause of posterior segment abnormalities, especially in the young rural male population.

Murty CS et al. (2015): Emphasized B-scan utility in traumatic cases with opaque media to detect choroidal or vitreoretinal complications.

Cataract Surgery 13.33% postoperative hypotony or inflammation can lead to serous choroidal detachment, particularly in cases with wound leak or surgical complications.

Previous studies Verma L et al. (2004) and Shah R et al. (1972) reported choroidal detachments in 4.9–10% of cataract surgeries, especially intracapsular cataract surgery.

Choroidal melanoma or metastasis can induce exudation, hemorrhage, or even mass-related detachment. In some cases, tumors themselves simulate or coexist with choroidal detachment.

Mithal KN et al. (2013) and Singh P et al. (2012) described choroidal melanoma detection via B-scan in opaque media. Intraocular Surgeries trabeculectomy, PPV, PRP, Scleral Buckling 3.33% to 6.67% each. These procedures are known to alter ocular pressure dynamics or involve direct manipulation of intraocular tissues, contributing to CD.

Trabeculectomy: can cause hypotony-induced serous CD (seen in up to 18.8% cases – Haga A et al.).

PPV and Scleral Buckling: Known to induce ciliochoroidal detachments, particularly in RRD or iatrogenic trauma (as described by Zhang T et al., Kawahara S et al.).

In this study the majority of patients (23 out of 30; 76.67%) had low intraocular pressure (<10 mmHg) at the time of presentation. A smaller number had IOP within the normal range (10–20 mmHg; 13.33%), and only 10% had elevated IOP (>20 mmHg). This difference was highly statistically significant ($p < 0.0001$). The choroid is highly vascular and sensitive to pressure changes. Variations in IOP can lead to a variety of choroidal responses, especially choroidal detachment (CD), which was the predominant lesion in this study.

Low IOP (<10 mmHg) 76.67%, Serous choroidal detachment is strongly associated with ocular hypotony. Hypotony may result from: postoperative states (e.g., trabeculectomy, cataract surgery), ocular trauma, inflammatory causes. The low hydrostatic pressure inside the globe promotes transudation of fluid into the suprachoroidal space, leading to serous CD.

Haga A et al. (2013): Reported mean IOP at time of CD was 5.5 mmHg post-trabeculectomy.

- Iwasaki K et al. (2020) Hypotony was an independent predictor of CD severity postoperatively.
- Verma L et al. (2004) also noted increased incidence of CD in hypotony after retinal detachment surgery.
- Normal IOP (10–20 mmHg) 13.33%, Some choroidal detachments, particularly hemorrhagic types, may present with normal IOP initially.
- Neoplastic conditions like choroidal melanoma may not alter IOP significantly unless they compress the angle or induce secondary glaucoma.
- High IOP (>20 mmHg) 10%, Less common, but may be seen. suprachoroidal hemorrhage causing angle crowding Secondary angle closure due to appositional kissing choroidal detachments.
- In this study, the majority of lesions identified on B-scan were choroidal detachments (90%), while only 10% were choroidal masses. This distribution was statistically significant (Chi-square = 33.00, $p < 0.001$), emphasizing the predominance of detachment-related pathologies in the studied population.
- Choroidal detachment (CD) (90%) is a common clinical consequence of trauma, intraocular surgeries, hypotony, and inflammation, all of which were prevalent among the patients studied.

CD can be:

- Serous: Usually secondary to hypotony or inflammation.
- Hemorrhagic: Often post-traumatic or surgical, involving rupture of choroidal vessels.
- Verma L et al. (2004) and Haga A et al. (2013), who reported CD incidence following retinal detachment surgery and glaucoma filtering surgeries.
- Pujari A et al. (2017) suggested the importance of differentiating CDs using B-scan when fundus view is obscured.
- Mass 10% Only 3 patients had choroidal masses, including melanoma and nevi. Smaller masses not being symptomatic or picked up without advanced imaging like OCT or angiography. Delayed presentation or misclassification. However, B-scan remains vital for detection and differentiation of intraocular tumors, particularly when media is opaque.
- Mithal KN et al. (2013) and Aironi VD et al. (2009), who emphasized that B-scan and A-scan echography help distinguish tumors from retinal/choroidal detachments.
- Singh P et al. (2012): Noted the declining rate of misdiagnosed melanomas with increased use of B-scan.
- In this study, 40% of patients were diagnosed with choroidal detachment (CD) as the primary pathology, with the remaining cases involving CD with retinal detachment (RD), vitreous hemorrhage (VH), and other associated findings. Choroidal melanoma and choroidal nevi were diagnosed in 6.67% of patients each.
- Choroidal detachment (40%) was the most common diagnosis, consistent with its association with: hypotony (post-surgical or post-trauma), inflammatory processes (e.g., uveitis, posterior scleritis), intraocular pressure-lowering medications (as observed in patients after glaucoma surgery or treatments).
- Choroidal Detachment with Retinal Detachment (16.67%) Retinal detachment is often a secondary complication of choroidal detachment, particularly in traumatic cases. The mechanical effects of fluid accumulation in the suprachoroidal space can increase vitreoretinal traction, leading to retinal detachment.
- Pujari A et al. (2017): Reported retinal detachment as a common secondary complication in eyes with pre-existing choroidal detachment.
- Choroidal Detachment with Vitreous Hemorrhage (13.33%) vitreous hemorrhage often occurs due to trauma or retinal tears, which may also cause tractional or serous choroidal detachment.
- Agrawal R et al. (2015): Found that vitreous hemorrhage was commonly observed in patients with posterior segment trauma and retinal detachment.
- Choroidal Malignant Melanoma and Nevi 6.67% Each. Choroidal melanoma is the most common primary intraocular malignancy. Although rare, its detection via B-scan in patients with opaque media is critical for early diagnosis and management. Choroidal nevi are often benign, but their detection requires careful monitoring to differentiate them from malignant lesions.
- Mithal KN et al. (2013) and Singh P et al. (2012), who emphasized the role of B-scan in differentiating malignant from benign choroidal lesions.

LIMITATION

- The study's small sample size (n=30) limits the ability to generalize the findings across larger populations.
- No histopathological confirmation of masses or melanomas, which could confirm the diagnoses.
- The study did not track longitudinal outcomes, such as whether lesions like CD resolved, worsened, or required surgery.

SUMMARY AND CONCLUSION

- This study was conducted in the upgraded department of ophthalmology, JLN medical college, ajmer.
- mean age was 51.0 ± 21.23 years. The majority of patients (46.67%) fell within the 30-60 years age range, followed by those above 60 years (33.33%).
- majority were male (76.67%) and a smaller proportion were female (23.33%).
- majority residing in rural areas (70.00%).
- The most common ocular history was injury (50%) of patients, followed by cataract surgery (13.33%) and malignancy in 10% patients. Other notable ocular histories included corneal tear repair (6.67%), pan retinal photocoagulation (3.33%), and penetrating keratoplasty (3.33%).
- majority of patients (76.67%) had IOP levels less than 10 mmHg, while 13.33% had IOP levels between 10-20 mmHg, and 10% had IOP levels greater than 20 mmHg.
- majority of patients (90%) had choroidal detachment, while a smaller proportion (10%) had a mass lesion.
- The most common diagnosis was choroidal detachment (CD), reported by 40% of patients. Other notable diagnoses included CD with retinal detachment (RD) (16.67%), CD with RD and vitreous hemorrhage (VH) (13.33%), and CD with VH (10.00%).
- The following conclusion can be drawn from the present study;

This study demonstrates that B-scan ultrasonography is a vital diagnostic tool for evaluating choroidal diseases, especially in cases with opaque media where direct ophthalmoscopy is not feasible. The most common diagnosis was choroidal detachment, often associated with low intraocular pressure, ocular trauma, or post-surgical complications. The majority of patients were middle-aged rural males, and the most frequent symptom was decreased vision. B-scan also effectively detected associated conditions like retinal detachment, vitreous hemorrhage and choroidal tumors (e.g. melanoma, nevi) proving its utility in both emergency and routine clinical settings.

REFERENCES:

1. Mundt GH, Hughes WF. Ultrasonics in ocular diagnosis. *Am J Ophthalmol.* 1956;41:488–98.
2. Baum G, Greenwood I. The application of ultrasonic locating technique to ophthalmology. *Arch Ophthalmol.* 1958;60:263–79
3. Hodes BL. Eye disorders: Using ultrasound in ophthalmic diagnosis. *J Postgrad Med.* 1976;59:197–203.
4. Mustafa M, Montgomery J, Atta H. A novel educational tool for teaching ocular ultrasound. *Clin Ophthalmol.* 2011. 5:857-60
5. Singh R, Umapathy T, Abedin A, Eatamadi H, Maharajan S, Dua HS. Choroidal detachment in perforated corneal ulcers: frequency and management. *Br J Ophthalmol.* 2006 Sep. 90(9):1111-4. [[QxMD MEDLINE Link](#)].
6. Brubaker RF, Pederson JE. Ciliochoroidal detachment. *Surv Ophthalmol.* 1983 Mar-Apr. 27(5):281-9. [[QxMD MEDLINE Link](#)].
7. Katz LJ. Ciliochoroidal detachment. *Ophthalmic Surg.* 1987 Mar. 18(3):175. [[QxMD MEDLINE Link](#)]
8. Moshfeghi DM, Kim BY, Kaiser PK, Sears JE, Smith S. Appositional suprachoroidal hemorrhage: a case-control study. *Am J Ophthalmol.* 2004 Dec. 138(6):959-63.
9. Berke SJ, Bellows AR, Shingleton BJ, Richter CU, Hutchinson BT. Chronic and recurrent choroidal detachment after glaucoma filtering surgery. *Ophthalmology.* 1987 Feb. 94(2):154-62.
10. Singh R, Invernizzi A, Agarwal A, et al. Enhanced depth imaging spectral domain optical coherence tomography versus ultrasonography B-scan for measuring retinochoroidal thickness in normal eyes. *Retina.* 2015 Feb. 35(2):250-6.
11. Coleman DJ, Silverman RH, Lizzi FL, et al. *Ultrasonography of the Eye and Orbit.* 2nd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2006.
12. Shields CL et al. *Ophthalmology.* 1997;104(8):1265-1276.