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### A New Classification of Vitreous Opacities by Ultrasonography

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#### Abstract

The vitreous is normally transparent. In the past, the transparency of the vitreous and associated problems of detailed clinical examination resulted in poorly defined concepts of vitreous pathology. With ultrasonography: “traction”, “contraction”, “organization”, “opacity” of the vitreous is standardized nomenclature in respect of both nature and location, and surgical techniques have been applied as necessary. Up to now there is no classification of vitreous opacity in medical literature. Author’s 3 degrees of vitreous opacity classification by ultrasonography was introduced with some details of description. Some results with this classification were reported here in.

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Key words: vitreous opacities; ultrasonography; vitreous opacity classification; cataract; no cataract.

#### 1. Introduction:

The vitreous is normally transparent, consists of collagen fibrils and hyaluronic acid molecules with the absence of blood vessels and cells. It is principally maintained by the blood-retinal barrier. Disturbances of intrinsic vitreous biochemistry are generally responsible for vitreous opacity. In the past, the transparency of the vitreous and associated problems of detailed clinical examination resulted in poorly defined concepts of vitreous pathology.

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With ultrasonography “traction”, contraction”, “organisation” of the vitreous is standardized nomenclature in respect of both nature and location, and surgical techniques have been applied as necessary [1, 2, 3]. Up to now, there is no classification of vitreous opacity in medical literature. In this paper a new 3 degrees of vitreous opacity classification by ultrasonography with some detail descriptions is introduced contributing in evidence-based medicine of ophthalmic practice.

With this classification the prevalence of vitreous opacity (VO) on persons  $\geq 50$  years old is primarily investigate and describe the relationship of vitreous opacity in two groups: cataract and no cataract.

## 2. Methods and participants:

This is a clinic-based study was carried on 1,975 consecutive patients consisted of 1108 men and 867 women who were examined by one ophthalmologist. If patient with having opacity one eye were selected for this study. If both eyes had VO, eye with higher degree of VO was chosen. Trauma, uveitis were excluded in this study. Principal measurements: The vitreous opacity was examined by ultrascan imaging system:

Alcon/version 2.02, probes 10MHZ, speed 12HZ, high 3-6mm, caliper measuring accuracy 1mm or 3%. Six basic probe positions according to Cynthia J Kendall [2] as follow:

1. Horizontal transverse at 6 o'clock,
2. Vertical transverse at 9 o'clock,
3. Horizontal transverse at 12 o'clock,
4. Vertical transverse at 3 o'clock,
5. Vertical axial: over cornea and,
6. Horizontal axial at 4-5 o'clock, this is scan that will image the macula. Cataract examination was done by direct ophthalmoscope Hein, indirect ophthalmoscope Scheepen. [3]. Description of this new classification: Three degrees of vitreous opacities was described as follow:

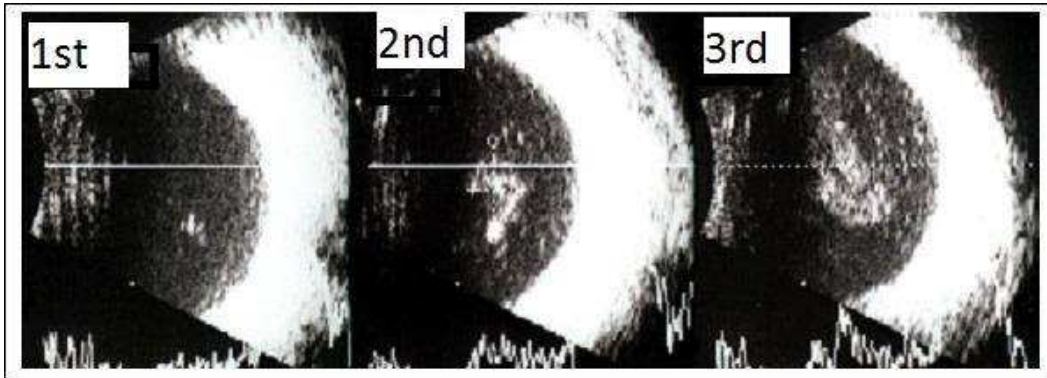
TABLE I : CLASSIFICATION OF VITREOUS OPACITIES

Degree	Opacity	Vision	Ultrasound B	Ultrasound A
0	No			
I = 1 <sup>st</sup>	Spot, spider, ring, fiber	No change	2mm	No
II = 2 <sup>nd</sup>	Small mass, traction(±)	Can affect partially. Can decrease	3x8mm	Positive+
III = 3 <sup>rd</sup>	Big mass, contraction, traction.	Totally	8x8mm	Positive++

If both eyes had VO, eye with higher degree of VO was chosen. [2,3]

TABLE II DIFFERENTIATION IN ULTRASOUND FEATURES

Ultrasound features	Posterior vitreous detachment	Retinal detachment	Choroidal detachment
Surface	Smooth,	Smooth, folded	Smooth, dome, flat
Funnel	Open,	Open, closed	At disc(-)
Insertion	At disc(±), Ora serrata(+) Ciliary body(+)	At disc(+), Ora serrata(+)	Ora serrata(+) Ciliary body(+)
Mobility after eye movement	Marked to moderate (+)	Moderate to none(±)	Mild to none (±)



**Figure 1: Three degrees of vitreous opacities ultrasonography: Left = 1st; Center= 2nd; Right = 3rd**

**3. Results:** Mean age (years) was  $65.1 \pm 11.2$ ; range: 50-89

**TABLE III : DISTRIBUTION OF VITREOUS OPACITY ACCORDING TO SEX**

Degree	Male: number (percent)	Female: number (percent)	Total: number (percent)
I	626 (72)	519 (73)	1185(60)
II	174 (20)	142 (20)	296(15)
III	69 (8)	50 (7)	99 (5)
Total	869(100)	711(100)	1580(80)

The prevalence of the vitreous opacity (VO) was  $80\% \pm 3.2\%$ , consisted of the 1<sup>st</sup> degree 60%, 2<sup>nd</sup> degree 15% and 3<sup>rd</sup> degree 5%. The percentage of VO on female was 82% (711/867 persons) and on male was 78.4% (869/1108 persons)

**TABLE IV : DISTRIBUTION OF 3 DEGREES OF VITREOUS OPACITY ACCORDING TO CATARACT AND NO CATARACT**

Degree	Male: number (percent)	Female: number (percent)	Total: number (percent)
I	626 (72)	519 (73)	1185(60)
II	174 (20)	142 (20)	296(15)
III	69 (8)	50 (7)	99 (5)
Total	869(100)	711(100)	1580(80)

OR=1.2, CI 95%=0.7-1.8; p=0.39.

**TABLE V : THE PERCENTAGE OF 3 DEGREES OF VITREOUS OPACITY ACCORDING TO CATARACT AND NO CATARACT**

Degree	Cataract: Number (percent)	No cataract: Number (percent)
I	91(65)	90(68)
II	35(25)	30(23)
III	14(10)	12 (9)
Total	140(100)	132(100)

The percentage of 3<sup>rd</sup> degree in cataract and no cataract was 10% vs 9%

In this case-control study the prevalence of VO on cataract group and no cataract group was 70% vs 66% (140/200 persons vs 132/200 persons) [4], whereas the prevalence of cataract was 44.9% (887/1975 persons) higher than a population -based study 33% in 1998.[5]

#### 4. Discussion:

There are many causes of the vitreous opacity. Asteroid hyalosis occurs in otherwise healthy eyes in elderly people. The opacities have little or no effect upon vision and are of no clinical significance. Synchysis scintillans is white cholesterol crystals, has its onset before age 40 but no relationship has been established with elevated blood cholesterol. Asteroid hyalosis and calcium have strong echoes. Weaker echoes are noted from clotted vitreous cells. Amyloidosis is a prealbumin, can be affecting partially vision according to size as well as position. Vitreous hemorrhage is an uncommon but serious disorder. It is usually due to traumatic rupture of a retinal vessel that caused posterior vitreous detachment (7-12%), retinal detachment (7-17%), neovascular post occlusion of the retinal vein (3-10%), but may be related to diabetes mellitus (39-54%), hypertension, perivascularitis, Eales' disease. Ultrasound can assess for the presence of a tractional retinal detachment involving the fovea when visualization is obscured by vitreous hemorrhage [6].

In this study causes of VO were not done. Up to now there is no classification of vitreous opacity in medical literature. A classification of vitreous opacity as mentioned above was introduced. The prevalence of VO on persons  $\geq 50$  years old is primarily done. The prevalence of VO on  $\geq 50$  years old was  $80\% \pm 3.2\%$ . This study was performed on consecutive patients for ophthalmic problems, was not a population-based study but this prevalence is primarily put a problem for ophthalmologists. According to John A Fielding with asteroid hyalosis, this is a senile degenerative disorder of an unknown origin occurring in one eye in 75% of cases [7].

The disadvantages of our classification of VO are vitreous mobility, polymorphism, different nature, and therefore the precision of measurement is relatively. The results showed 2nd and 3rd degrees that can affect vision are 20%.

We considered VO as a sign of case-control study compared the relationship between cataract and no cataract patients. All the cases of trauma and uveitis are excluded in this study. A case-control study was assessed the vitreous opacity between cataract and no cataract by the odds ratio: 1.2, 95% confidence interval 0.7 to 1.8,  $p=0.39$ . (TABLE IV). Vitreous physically buffers in the internal ocular organs from shock and trauma. It also acts as a nutrient and waste products reservoir for the surrounding tissues. Glucose is taken up by the metabolic in retina and lens, sodium and potassium are exchanged at the lens posterior surface, and magnesium is secreted into the vitreous from the retina, lactate and pyruvate diffused from the retina into posterior vitreous. Both ageing and metabolic diseases can affect the vitreous body; the collagen network tends to collapse forming small lakes of fluid in the matrix. Diabetes may change the collagen as well as amino sugar of the vitreous caused vitreal contraction and detachment [8].

The percentage of 3rd degree in cataract and no cataract was 10% vs. 9% (TABLE V). The artifact may be excluded vitreous opacity [9]. Vitreous opacities can be classified according to their causes [10]. The ocular disorders after lens extraction may be increased the risks for VO. Therefore, a further prospective study on pre and post lens extraction should be done for identifying.

The ultrasonography is cost benefit, effective, less invasive on patients, should be done for preoperative cataract patients in mobile cataract surgery camps [5] (high volume) for screening preoperation as well as in prognosis vision post operation.

#### Conclusion:

This study primarily introduces a classification of vitreous opacity on elderly persons with easily use in ophthalmic practice. Further study the relationship of vitreous opacity and visual acuity should be done for confirming vitreous opacity as risk factors in order to prevent as well as treat as soon as possible. With these 3 degrees of vitreous opacity classification ultrasonography, the percentage in cataract and no cataract group has no difference in statistics. A prospective study should be done for identifying the relationship of vitreous opacity between unoperated cataract and operated cataract.

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