·Review·

Tests for malingering in ophthalmology

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Abstract

• **Simulation can be defined as malingering, or sometimes functional visual loss (FVL). It manifests as either simulating an ophthalmic disease (positive simulation), or denial of ophthalmic disease (negative simulation). Conscious behavior and compensation or indemnity claims are prominent features of simulation. Since some authors suggest that this is a manifestation of underlying psychopathology, even conversion is included in this context. In today´s world, every ophthalmologist can face with simulation of ophthalmic disease or disorder. In case of simulation suspect, the physician´s responsibility is to prove the simulation considering the disease/disorder first, and simulation as an exclusion. In simulation examinations, the physician should be firm and smart to select appropriate test (s) to convince not only the subject, but also the judge in case of indemnity or compensation trials. Almost all ophthalmic sensory and motor functions including visual acuity, visual field, color vision and night vision can be the subject of simulation. Examiner must be skillful in selecting the most appropriate test. Apart from those in the literature, we included all kinds of simulation in ophthalmology. In addition, simulation examination techniques, such as, use of optical coherence tomography, frequency doubling perimetry (FDP), and modified polarization tests were also included. In this review, we made a thorough literature search, and added our experiences to give the readers up –to –date information on malingering or simulation in ophthalmology.**

• **KEYWORDS:** malingering; simulation; conversion; hysteria

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INTRODUCTION

Simulation or malingering can be defined as intentionally counterfeiting a disease with benefit instinct like in case of malingering, or misattributing his/her symptoms to another irrelevant clinical entity like in case of exaggerating. If the subject believes that he/she is really ill, then it is called 'conversion reaction' or 'hysteria'. In case of conversion, subject really lives his/her symptoms and can't control or even know that they are psychogenic in origin[1-5]. In all cases of real simulation (malingering) or negative simulation there is only one instinct: benefit. It may be monetary or nonmonetary. It would be sometimes escape of military service or work, get reduction of court penalty, get compensation from social security agencies or insurance companies, and get unnecessary free medicines or medical equipments. The aim is rarely attraction of sympathy, help of family or social environment.

Determining real incidence or prevalence of malingering is difficult, because majority of cases is not reported. Villegas and Ilsen[1] reported that 10%-30% of outpatient population of neurology clinics has no organic pathology and 1/3 to half of population applying to primary and secondary care settings have no pathological lesions. In a study of 17 cases of idiopathic intracranial hypertension, Incesu and Sobaci [2] reported that all patients imitated functional visual acuity and field loss and also 88% of presents with significant psychiatric, psychosocial or other medical coexistent pathologies. In some research papers 1% -7% of all eye clinics outpatient population is reported as simulation [3,5]. Some of these percentages are reported from a tertiary university or military reference clinics; therefore, real incidence or prevalence has not yet been determined. Most strikingly, 13% of all psychiatry outpatient cases, 45% of social security compensations or legal claims are reported as simulation [1,4]. An article presented by Gandhi and Amula reported that 59 billion USD were paid to simulation cases by insurance companies in 1995 in USA [5]. Villegas and Ilsen[1] reported that 5%-12% of patients present with visual loss to a neuroophthalmologist are diagnosed as functional visual loss (FVL). In clinical examination, if the subject expects a monetary benefit or if complaints and examination findings do not fit into a diagnosis or not coinciding to each other, then clinician must suspect that it would be a simulation case[3,4,6-8].

Sobaci [3] and Thompson *et al* [9] classified those problematic cases into three classes. The first one is intentional simulation case, the second, hysterics that are innocent but open to autosuggestions, and the third is the subjects exaggerating symptoms. Understanding the psychological nature of visual loss and subjective findings may be relatively easy. But looking for counter evidences like visual acuity tests, visual field analyses, electrophysiological tests *etc.* proving simulation is a difficult task. In these cases all subjective and objective tests should be applied. During subjective tests like visual acuity, contrast sensitivity and visual field tests sincere cooperation of subject is needed. But if the subject is uncooperative and says that he/she does not sees at all or even he/she tries to fake ophthalmologist overtly, it is hard to interpret the examinations. In these cases the examinations and tests are widely expanded.

In this situation, techniques that examine light sensation [visually evoked potentials (VEP), electronystagmography (ENG), electroretinography (ERG) *etc.*], visual acuity (optokinetic nystagmus, pattern VEP *etc.*) and probes retinal pathology and its burden on vision optical coherence tomography (OCT), ERG, fluorescein angiography (FA) or indocyanine angiography (ICG) *etc.* are needed. Complex and diversified tests and equipments make simulation more difficult and risky for the subject. It is a necessity for clinicians to categorize the case as a positive simulation or negative simulation. Simulation cases are guilty and psychopathic but brave characters and they are guided only by benefit instinct[3,7,10]. To undercover the simulation requires a precautions, fast, kind, skilled and discreet ophthalmologist and a thorough examination.

Another aim of this paper is to remind ophthalmologists FVL cases are not always guided by events such as early retirement, immunity to military service, salary of disabled, escape from court penalty like benefits; sometimes it would be a simple neurosis or conversion case. In these cases without complex tests and examinations, it's possible to make a definite diagnosis with relatively simple and easy simulation examination techniques. Simulation, in general, is met in military recruitment or early retirement or disabled salary, work or traffic accidents or criminal fights examinations. In these cases, subject sometimes comes with simple changes or very little pathology in palpebrae, conjunctiva, cornea or pupils and attempts to intentional exaggeration or simulation. It is advisable that ophthalmologist should be experienced in simulation examinations and has sufficient equipment. If no alternative exists subject should be hospitalized inventing an irrelevant and innocent diagnosis and followed closely without the subject's awareness.

SIMULATION OF VISUAL FIELD DEFECT

There are three types of common visual field defects simulation. Nonspecific contraction, spiral and tunnel view. Rarely star shaped defects would be seen [4]. In general, if a visual field is not consistent with another types of tests (Goldmann, automated, confrontation, tangent screen, infrared pupil campimetry) would be a probable functional test [11,12]. Amputation simulation sometimes may also be observed.

Subject may exaggerate an already present defect, perhaps make deeper and larger an already present small defect. In an article studying preinstructed simulation cases, six cases' visual fields examined by experienced and inexperienced technicians are discussed. Cases in spite of very little instructed information about simulation would be successful in simulation and even reported that experienced technicians are easily cheated. Wide blind spot, quadrantic, hemianopic and altidunal defects are easily simulated whereas centrocaecal and paracentral defects are simulated with difficultly, but those defects are easily misrepresented as chiasmal pathologies[9]. It's wise to follow the subject secretly longtime enough to understand whether claimed visual field narrowing and subject's routine daily life is compatible. If subject can easily walks around the objects in the room simulation is suspected [4]. A defect that is near more than 10 or 20 degrees to central fixation spot is not compatible with free daily life. On the other hand, automated perimetry is not convenient in case of suspect visual field loss. There may be big fluctuations in reliability indexes and normal indexes can't guarantee that subject is normal as well. In those cases, it's prudent to prefer Goldmann or Tangent Screen tests. In unilateral visual field loss Tangent Screen claims to be more reliable [3,13]. In general Goldmann perimetry is preferred over automated techniques. The reasons are: 1) Organic and functional defects could not be easily distinguished with automated techniques. 2) Generally indices of reliability are reported similar in organic and functional cases in automated technics. 3) Malingerers can easily simulates defects of neurological cases even better than those of real pathological cases in automated perimetry[4].

An article reports that frequency doubling perimetry could be safely performed in children over ten years old. If this study would be accepted as a reference, children older than ten years may be examined with frequency doubling perimetry in case of simulation suspect[14].

It has been shown that conversive visual field losses frequently present with tubular bilateral defects. Unilateral conversive visual field loss is rare [15,16]. It has also been reported that conversive defect's size doesn't change no matter what the subject's distance to perimeter and visual

field will be round with sharp edges[17]. Spiral and ring defects or hemianopias are rarely observed in conversions but simulation. An article reports that visual field defects which respect vertical meridian and has relative afferent pupillary defect (RAPD) and hemianopia that fades away in binocular visual field testings are very rarely would be due to simulation[18]. As a matter of fact such visual field defects are due to in general pituitary adenomas or very rarely transient or long-lasting ischemia, ethambutol toxicity, demyelinating disease and some retinal degenerations[19].

In an article comprising 133 cases, the most frequent complaint is visual acuity loss with normal visual fields. Seventy-three percent of the cases is diagnosed functional loss with abnormal neuroophthalmological findings (functional overlay). Functional overlay is coexistence of functional loss and ocular (especially neuroophthalmological) disorder. The same article reports that except for central defects, any kind of field defect doesn't indicate definitely organic pathology. Article advices that even case is thought as simulation, if central defect is observed, an organic pathology must be ruled out immediately[20].

Frequently encountered visual field defects that remind simulation are:

Concentric Narrowing (Tubular Defect) It's characteristics of advanced glaucoma, papillary drusen, typical optic atrophy with different etiologies, some postcommotional syndromes, frontal lob tumors and retinitis pigmentosa. If tubular view defect is encountered in cases without documented pathologies mentioned above must remind simulation [13]. An objective check test of concentric absolute defects with scotopic VEP is described[21]. In normal people peripheral VEP responses were shorter in latency and larger in amplitudes than central responses. But in patients with advanced glaucoma and retinitis pigments peripheral VEP sensitivities were worse than central and even no response would be expected. Malingering cases' responses are expected like normal people in suspicious concentric field defects[21]. Clinically bilateral pathological tunnel vision cases can manage daily activities without hitting furniture or doors but malingerers especially hit furniture or objects around[22].

From medicolegal standpoint, concentric defects of postcommotional syndromes could completely fades away in time.

Spiral Defects It's encountered in severe physical or neurasthenical exhausting of adults. It's frequent in conversion and malingering. It's one of the classical functional visual field loss samples. In Goldmann examination, subject points projected stimuli more and more outer positions of meridians. In second eye typically very narrow tubular vision is observed. If in the second time examination turn of eyes is changed, the pattern will be reversed and it's a classical sign of functional loss[4].

Some rarely encountered simulated visual field defects are:

Systematic defects These are rare and could be identified with two successive examination sittings. First it's performed in usual way, second fixation point is deplaced 20-25 degrees away from its real position. Simulator defines defect on the same localization in the two successive examinations, but in reality change of fixation point deplases defect's localization[23].

Hemifield defects Hemianopic defects are observed in juxtacellar pathologies or occlusion of central retinal arterioles. Sometimes it may present without RAPD or optic pallor in probably early cases [19]. Those cases are observed with monocular hemianopic visual field defects. Multifocal ERG (mfERG) can present naso-temporal differences in amplitudes and latency. Multifocal PVEP also discloses asymmetry between nasal and temporal fields [24]. In cases of simulation, no mfERG or mfPVEP inconsistencies between nasal and temporal parts of retina are observed.

One article defines a case of monocular altitudinal visual field loss due to malingering [25]. This type of defects are generally met in ischaemic optic neuropathy, hemibranch vascular occlusions, advanced glaucoma, chasmal lesions and optic nerve lesions like colobomas. Close look up of the Humphrey test in malingering cases reveals that threshold sensitivities on both of hemifields were nearly same and normal. This is paradoxical. Patient anxiety indicator false positive response index is also high like 67% and monocular lesion is unexpected when threshold sensitivities of both hemifield are considered similar. Article advices to look at pattern deviation, threshold sensitivities and interpreting test in the light of other clinical tests[25].

Another type of defect is associated with bilateral homonymous hemianopia and observed in postchiasmal lesions. Those lesions would be documented with tomography or magnetic resonance with contrast matter. At the other hand in those cases Wernicke pupil test could be also performed as an objective measure [18]. In real pathological cases when light projected in slit lamp to retinal field corresponding to visual field loss miosis isn't observed, while projected to retinal field corresponding to normal visual field miosis is observed[18].

Tests for Simulation of Visaul Field Defects

Goldmann kinetic perimetry With little bit of experience, defect simulation could be easily diagnosed in Goldmann perimetry. Complex procedures of Goldmann perimetry confuse simulator [13]. Nevertheless it must be remembered that an experienced simulator could overcome Goldmann perimetry[9]. Crossed or spiraling isopters defects are common

in Goldmann but they look like generalized contraction in automated perimetry and are diagnosed as functional loss.

In order to use this perimetry efficiently, test stimulus, size and luminosity combinations should be prearranged. Reaction of subject and eccentricity of index 4 and intensity Ⅲ is the same as that of index 3 and intensity Ⅳ. Both isopters are identical and full superposed. Simulator thinks that decreasing of size of stimulus is important and finds logical to respond more slow to index 3, intensity Ⅳ targets. An article advices that increasing stimulus luminance is better than increasing stimulus size in check perimetry[26].

Another option is to change test order. If a stimulus is projected slowly on diagonally opposite sides, sometimes absurd and anarchic pictures develop and these pictures doesn't coincide with any known pathology[13].

Here are some malingering detecting tests of Goldmann perimetry:

Inversion of isopters sign Inversion of isopters sign can be used again for functional loss check. According to simulator, an isopter recorded centrifugally is narrower compared to centripetal. But if persistence of retinal image phenomenon is considered it's contrary to normal case[15].

Distance phenomenon Distance phenomenon can also be used. If simulating subject moves himself out 30-40cm from the initial position, in normal cases visual field size would be expected to be larger, but simulator reports visual field is the same or paradoxically smaller than primary examination[15].

Binocular visual field examination Organic monocular defects evade entering sound eye's field in normal cases. But in functional loss cases monocular defect lasts in binocular examination[15,16].

Range of variation After the first two points spotted in Goldmann test discarded, range of variation of subject's test compared to those of normal cases. In normal persons, mean number of range in first decade was 5.5, after second decade was 4.2 degrees. In hysteria cases the mean range number was 14.2 degrees, and the difference between two types of persons is significant[21].

Automated perimeter Automated perimetry is an objective investigation and doesn't let prejudices about size and localization of the defect, but at the same time it's a subjective test and its reliability is less than Goldmann perimeter because it needs full cooperation of the subject. As shown by some authors that various programs and parameters used by automated perimeter are not useful against malingerers who are aware of machine's abilities and detail [3,27-29]. For example, if a simulator ignores intentionally one of four reliability indices, machine starts using brighter spots trying to measure sensibility of pseudoquadranopic defect which reminds simulation right away[13]. As a rule, bad reliability indices reminds simulation and it's a good sign for examiner [15]. But as a matter of fact, this type of intelligent and informed malingerers is rare. In general, reproducibility of simple defects is easy. As a result, automated perimetry is not superior to Goldmann for this purpose. Even if they are performed under identical conditions it's not logical to compare them. Especially automated perimeter can't discriminate defects like tubular or spiral whether they are organic or functional[12].

When complete tubular vision cases of cortical blindness are considered, if defect limits lean to vertical meridian it's pathological and important in discriminating from simulation[15].

If examiner suspects of simulation, but can't prove it, visual field examination is repeated after one or two weeks and compared to former ones. Besides of visual field, electrophysiology, angiography, imaging with contrast matter, cardiovascular consultation, blood biochemistry, complete blood count (CBC) and policytemia tests are also evaluated and would be useful[15].

Pupil campimetry Pupil campimetry can correct disadvantages of automated perimetry. Pupil looks unintentionally at all stimuli projected by perimeter and those unintentional pupillary moves are recorded by infrared pupil campimetry. If subject does not respond to photic stimuli intentionally, infrared pupil perimetry discloses simulation[12]. This test leads to comparison of the conventional visual field and pupil campimetry records. If the two records does not correspond visual field perimetry is functional. Pupil campimetry and automated perimetry concordance is especially better in retrogeniculate pathologies [30,31]. On the other hand, identification of pregeniculate lesions with pupil campimetry is difficult and of no reliability[31].

In general, the most simulated defect is tubular vision [15]. Simulating subject presents the same radius of isopter no matter what the test distance is in different test sittings. In fact, confrontation and Goldmann perimetry would be valuable as check tests. In both of confrontation and Goldmann visual field examinations can be performed from different distances [30]. No matter which technique is used, visual field test must be performed in at least two different distances. In lots of pathologies (terminal glaucoma, terminal papilledema, tapetoretinal degenerations, chiasmal tumors, bilateral occipital lob infarcts) real tubular vision is encountered [3,]. Again in tangent screen real pathological defects' isopter size doesn't change in both of distances. But in other tests isopter size enlarges if the distance to bowl increases.

Some cancer associated retinopathy (CAR) cases sometimes would be thought as malingering [27] Subject

can present with visual effects like peripheral visual field loss, reduced color vision and even visual acuity. But fundus examination does not reveal anything other than some arteriolar narrowing. Suspicion along with dark adaptation and ERG pathology and ring field loss leads to CAR paraneoplastic antibody tests and diagnosis could be set[27].

Reverse Galilean telescope Reverse Galilean telescope can be used in conjunction with kinetic automated perimetry [32]. Organic field loss cases are noted in visual field expansion with reverse Galilean telescope. Malingering tubular defects are equal or smaller than that of previous kinetic automated perimetry without reverse Galilean telescope.

Saccade test This test can be easily performed bedside. In organic visual field losses, saccades are in small and erratic pattern towards the field defect. Malingering people can easily jump to the presented fixation point in one directional big saccade even the stimulus point is outside of malingerer's alleged visual field [33]. Sensitivity of the test is 87% and specificity 100%. Test is easy, fast, reproducible and does not largely necessitate the cooperation of subject.

Follow test If subject comes with bilateral serious visual field loss claim and doesn't cooperate in perimetry he/she must be followed closely and secretly. Again, if examiner shouts from a distant place and subject's regards turn to the examiner one would think probably his/her peripheral vision must be larger than his/her claim. Again real organic patients with bilateral narrowing or tubular vision can walk around of obstacles without hitting. When examiner feels hesitation, subjects are hospitalized with a fake diagnosis and followed secretly all around clock with experienced eyes. Lots of information about his/her management with visual field loss and indirectly about central and peripheral vision can be gathered

Confrontation Confrontation is also a useful test in visual field simulation. It is possible to perform visual field tests with confrontation and tangent screen in different distances[17]. Whatever technic is used it's necessary to perform the test in two distances. Because in plenty of pathologies like terminal glaucoma, terminal papilledema, tapetoretinal degenerations, chiasmal lesions, bilateral occipital lobe infarcts real concentric narrowing could be identified with confrontation[5,17]. Suppose that confrontation is performed for example from 1 m of distance and simulating subject state that he/she sees only hand of examiner when approaches to the face. Than confrontation is performed again from 2m and if subject states again that he/she sees hand when hand approaches to face, it means he/she is malingering.

Tangent screen Tangent screen is also useful in unilateral visual field loss claims. In such cases, sound eye is tested first and blind spot is identified. Then so called weak eye is tested and typical pipe vision is observed. Then both of eyes are open tested and weak eye's defect is lost in sound eye's visual field. In simulation cases, if the visual field area is less than 10 degrees, blind spot does not fades away in sound eye's visual field. In some cases, after this three-step test, some bizarre unexplained visual field samples may occur. For example, in a subject who has normal field in one side, tunnel vision in other, both eyes open tangent screen may produce an irrational hemifield loss [17]. Another option is enlarging testing distance. Tangent screen is performed from 1 m than it's performed from 2m with twofold big target size. In normal, visual field remains the same. Again in functional loss cases visual field doesn't enlarge and even may be contracted[27].

If subject claims bilateral serious visual field loss and doesn't cooperate, it's convenient to follow subject closely by not letting him/her notice. If examiner calls subject from distance and subject turns to examiner's place, it's thought that his/her peripheral vision is wider than his/her claims. Again a real organic patient with bilateral pipe vision can easily walks without hitting any obstacles around [17]. But in contrast, malingerer bumps intentionally. If examiner hesitates, the patient can be hospitalized with a fake diagnosis and followed all day without making him/her notice. In this follow-up it's possible to get an impression about subject's behavior and central and peripheral visual fields[17].

Motility tests Motility tests also can be used for measurement of visual acuity level in cases simulating tunnel vision. A case who claims pipe vision can be examined by doctor to check his/her regard to saccade between the very near two points. Then examiner slowly increases the distance between two points and asks subject to keep up regarding saccades to and fro. Saccade means fixing to a visible target and a point in vicinity and subject seeing with difficulty makes it hard. But simulator can do that easily without knowing the fact[17].

Pupillary examination Pupillary examination would be helpful in discrimination of simulation in visual field loss. In cases of asymmetric visual acuity or visual field loss, problem must be of either intraocular (retinal) or the optic nerve. Intraocular lesion doesn't cause afferent pupillary defect and can be easily identified in clinical examination. On the other hand, optic nerve lesion must cause relative afferent pupillary defect (RAPD). So, in cases of unilateral visual acuity or field loss cases if clinical ocular examination is normal and no afferent pupillary defect presents, then it's a simulation case[17].

Laboratory tests Laboratory tests in simulation, especially in cases related to the optic nerve are significant. In cases with suspect of pre and retrochiasmal lesions computerized

tomography and magnetic resonance imaging with contrast matter is necessary. No lesion in imaging techniques doesn't mean simulation but suspect increases. If examiner orders extra tests, VEP can be performed. A VEP recording with normal latency and amplitudes strengthens simulation probability. Technician performing VEP must be asked about cooperation of subject. With strong probability simulation cases don't want to cooperate and even try to sabotage the test.

Multifocal electroretinography and visually evoked potentials Multifocal ERG and VEP are relatively new technics to check conventional perimetry technics. Especially mfVEP can detects field defects whether they are organic or malingering [34,35]. The diagnostic quality of mfVEP is especially augmented when combined with mfERG [34,35]. An article states that more than 4 microvolt difference between two hemifields is accepted as clinically relevant [34]. Another article advices combined use of pattern VEP (pVEP) and pattern ERG (pERG) to identify malingering or conversion[36]. Bilateral visual field narrowing associated with nearly normal fundus view for example in retinitis sine pigmentosa and congenital stationary night blindness pVEP may present minimal findings but on the other hand even flash ERG (fERG) presents marked pathology. Meanwhile fERG can not disclose small retinal area pathologies like maculopathies whereas pERG easily identifies those maculopathies or other small critical retinal area pathologies[36].

SIMULATION OF NIGHT BLINDNESS

This type of simulation is frequently observed in military recruitment examinations. Subject may want to avoid military service or night shifts at work or military. Rarely in traffic accidents or criminal cases to decrease responsibility in front of lawsuits night blindness simulation may be noted. Clinical retinitis pigmentosa is easily diagnosed with typical fundus view. Sine pigmento, stationary or atypical cases may require additional laboratory tests [37]. Fleck type RPE lesions may be encountered sometimes and might misrepresent retinitis pigmentosa so needs to be investigated[22].

Dark Adaptometry Discriminating a simulator is easy with typical irregular responses and absence of monophasic responses at the end of recordings. In lots of simulation cases upslide of threshold (exhaust phenomenon), monophasic dark adaptation and especially increase of absolute cone and rod thresholds could be observed. Exhaust phenomenon means direct simulation [4,10]. This test when used combined with phosphorylated Barany cylinder can objectively induce nystagmus elicited by the rods in dark adapted simulators.

Electroretinography Full field ERG points out simulation right away. If combined responses from rods and cones are normal, it's absolutely simulation. ERG may also protect ophthalmologist from medicolegal claims objectively. The value of negative ERG recording has been reported for this purpose[22,37]. Rod responses are completely absent and b peak amplitudes as late dark adaptation indicator are negative (under isoelectric line). An article presented from a tertiary military clinic reports that 495 full fields ERG are performed and 22 negative b wave cases are identified. 14 stationary night blindness, 5 X-linked juvenile retinoschisis and 1 macular dystrophy are diagnosed. Seven of 14 stationary night blindness presented normal fundoscopic examination[22].

Epstein-Lesser Test After dark adaptation 680nm-720nm red light is projected to subject's eye. This wavelength excites only macula and separates rods, so it's easily seen in night blindness. But, malingering subject supposes the test as a proof of night blindness and refuses that he/she can see[5].

Blue and Red Discs Blue and red discs are shown to subject under same light conditions and light is gradually decreased. This test is based upon the principle that Purkinje phenomenon gets reverse in essential hemeralopia. In normal case red transforms to black faster than blue. In night blindness without visible fundus lesions the situation is reverse. Simulator responds like either normal case or says two colours transform at the same time[5].

Dark Room Test It can be tried first to observe the simulator's behavior to find a white sheet of paper placed in different locations on the floor. Simulator is expected to exaggerate passing by them.

Visually evoked potentials test In normal persons VEP threshold is 0.2log unit over of subjective threshold, but real night blind's is 0.4log unit over. But alpha activity of electroencephalography (EEG) of some normal cases may interfere with VEP recordings and interpretation of recordings may get difficult [38]. Also congenital stationary night blindness would be diagnosed with scotopic VEP examination [39]. Prolonged pattern reversal potentials (PRVEPs) with lower luminance stimulus would be much more sensitive to some visual disorder diagnosis.

SIMULATION OF DISCHROMATOPSIA

In general, in a traffic or railroad crossings accident the guilty person sometimes could claim dyschromatopsy of himself or rival's. In some countries in entering examinations for military schools, gun or driving licence examinations and working for textile industry subjects could imitate negative simulation (denial of existent pathology). Examinations performed to demonstrate presence of dyschromatopsia are indicated below.

Ishihara Pseudoisochromatic Plates In cases of negative dyschromatopsia (denial of color blindness) claim, simulator can't read the original Ishihara plates as expected. Do not forget to change the order of color plates just before of

examination to prevent the prememorization of numbers by simulator. In cases of positive simulation, subject exaggerates and intentionally does not read any of numbers printed in plates as well as the first plate with preliminary example number which easily could be read by everybody even dyschromates. Also, simulator may read the letters different from what he/she read in the previous examination. For illiterate people, there are also plates with colored labyrinths. In case of negative malingering color labyrinth plates are very useful. Because they can not be memorized[22].

Classification Tests (Farnsworth 100 hue, 15 hue tests) Simulators claim that they never can classify hues of color buttons in order, but even dyschromate people can classify color plates more or less.

Anomaloscop It easily discriminates simulators but rarely found in ophthalmology clinics.

Newly developed cone isolation Flicker ERG can assess long (L), medium (M) and small (S) cone cells' functions and counteractions and so color sense sensitively[40].

Color tests are also useful in unexplained visual loss cases. More or less central visual acuity loss is noted in cases of real acquired dyschromatopsia unless the case is achromatopsia. For example, cone dysfunction syndromes with frequently expressed with apparently normal fundus are accompanied with central acuity decrease, dyschromatopsia and ERG anomalies [41]. According to a paper mostly optic neuropathy, than accordingly macular disease, media opacities and amblyopia cases present with overt dyschromatopsia and loss of central vision[41].

SIMULATION OF DIPLOPIA

Subject sometimes claims that he/she has a healed diplopia or a diplopia worse than in actual. First of all, it is necessary to make sure that subject does not have monocular diplopia after anterior and posterior segment examinations. Binocular diplopia would be explored with careful oculomotor motility, worth four dots and prism interposition tests that can easily disorientate simulator and Lancaster test confirms if there is really diplopia and quantify it. At last, visual field examination with worth colored glasses can show diplopia zones say final word. No simulator can pass all those examinations without fault.

Another way is Graefe's test The bad eye is covered and the other one experiences diplopia after the pupil bisected with base out strong power prism lens. Then bad eye is uncovered and at the same time prism lens slipped over from sound eye and diplopia asked. If diplopia is expressed malingering is manifested[5].

SIMULATION OF OCULAR MOTILITY DISORDERS

Intentional Nystagmus Requires special attention. On the other hand, intentional nystagmus is also observed sometimes. Simulated nystagmus is typically of high frequency, small amplitude pendular jerks. In general, they are horizontal, rarely may be vertical or torsional. Eye movements are bilateral, conjugated and accompanied with frequently palpebral tremor, blinks, constraint face expression and perhaps sometimes inducted convergence or divergence[3,42]. It rarely lasts more than 10s or 15s. No other neuroophthalmological signs present. It easily resolves after a long conversation[3]. Approximately 8% of university students can imitate voluntary nystagmus. On the other hand accompanying myosis is typical sign of malingering[42].

Inducted eso or exotropia and nystagmus concordance which would be sometimes latent is generally alarming to ophthalmologists. Rarely alcohol induced positional nystagmus or lateral canal benign paroxysmal positional vertigo might be confused with pathological congenital nystagmus [42]. Alcoholic nystagmus is met in chronic alcoholic drunk people. Typical alcohol smell and alcohol dosage in blood are enough for diagnosis. Lateral canal vertigo related nystagmus appears suddenly and positional changes cause change of nystagmus direction. Ear-nose-throat (ENT) surgeons also easily discriminates it from ophthalmological nystagmus.

Monocular Diplopia It is a rare complaint and usually results from pathologies within globe like opacities of lens or cornea, high astigmatism, dislocated lens or partial retinal detachment. Pinhole test is enough to discriminate real monocular diplopia from reasons cited above. On the other hand nonorganic etiology is suspected if biomicroscopical and fundoscopic examinations are normal [43,44]. Much more rarely polyopia or monocular diplopia cases originating from cerebral pathologies would be encountered. Those cases are accompanied by major visual field defects and some other parietal dysfunction signs like spatial disorientation, extinction of cutaneous sensation or ocular fixation disturbances[43].

Simulating subject is encouraged at first and told he/she has no organic pathology and he/she does well. Then if simulator insists the prism or oculocephalic tests could be performed[3].

Prism Test The bad eye is covered and pupil of good eye is bisected by the base of a strong prism lens. Then the bad eye is fastly opened while prism is slipped over the sound eye without subject conceives what happens. If subject professes again diplopia, it is malingering[5].

Oculocephalic Test Oculocephalic test is used to check whether nystagmus originates from pathologies of cranial nerves (abducens, oculomotor, trochlear) that composes neural circuit from brainstem to globe and controls eye movements. Examiner holds head of subject and tilts from one side to the other. During tilt subject's eyes move to

opposite direction of tilt to regain fixation in subject. Very rarely eyes would not move in some awake subjects. If nystagmus develops during test instead of refixation move it indicates brainstem pathology[32].

Near Reflex Spasm It would be like abducens nerve paralysis. It's manifested by myosis in abduction. Additional pathological neuroophthalmological and near/ convergency dissociation signs must be looked for real organic cases. Sometimes psychiatric help would be necessary[3].

Fixed Dilated Pupilla There are three reasons in etiology. Mydriatic drops, oculomotor paralysis and Adie's pupilla. One percent of pilocarpin drop test can distinguish parasympathic denervation from mydriatic drops. Pilocarpin can easily overcome parasympathetic denervation but no mydriatic block that can last sometimes a week and then finally resolved. During this period patient must be observed and made sure that no more mydriatic drop is instilled. Traumatic dilated pupilla again responds well to pilocarpin. Adie's pupilla also responds to 0.1% pilocarpin quickly [3]. Oculomotor paralysis presents with esotropia and ptosis along mydriasis.

Dilated Pupilla Very rarely some youngsters with high blood adrenalin levels can imitate this condition[3]. Anisocoria must be looked for intentional cases and pupillary light reactions are compared.

Accomodation Paralysis It's seen in children and youngsters. They can't read near without hypermetopic lenses. Far vision is normal. When pupils get smaller naturally after cycloplegia they feel comfortable. When subject corrected for far and complains again for near, it's thought as simulation.

Convergence and Blinking Some people can easily imitate convergence or blinking. When subject converge his/her eyes and if myosis observed it is malingering. When ophthalmologist meets to blinking, it is malingering if it is paroxysmal and does not disappear in dark room[42].

Ptosis Voluntarily generated ptosis can be achieved by some people. Myastenia gravis, chronic progressive external ophthalmoplegia are some of organic reasons of ptosis. If ipsilateral eyebrow depression present, it is a case of malingering. In organic cases eyebrow elevation is encountered[44].

NEGATIVE SIMULATION DISORDERS (DENIAL)

It is encountered during entrance examinations of some professions like police or military forces, railroad workers, flying personnel like pilots, fly engineers, submarine officers. Subject tries to hide his/her sensorial deficits like dyschromatopsia, amblyopia, low level stereopsis *etc.* Sometimes it would be necessary to look for unexplored amblyopia.

Central Vision Anomaly Denial In the examination, examiner must close unexamined eye tightly during examination and must follow the subject while he/she reads optotypes. To prevent the memorization of optotypes it's prudent to show letters or numbers at random order. Before examination it's prudent to check whether the subject wears contact lenses. Examiner has to be sure that subject has no experience with the optotypes. Presence of lower level of stereopsis must also warn ophthalmologist against asymmetric visual acuity.

Perimetric Changes Denial Visual field loss might be accompanied by normal visual acuity. Special head postures while reading or special sit positions in examining room should warn examiner against visual field problems. In these cases, Goldmann kinetic perimetry, computerised perimetry or tangent screen would be helpful.

Night Blindness Denial Typical retinitis pigmentosa is rare and symptomatic tapetoretinal degenerations have characteristic fundus findings. Fundus examination and dark adaptometry can be used in discrimination of some suspect cases (stationary, sine pigmento). At last resort, chromoptometric cylinder, dark adapted ERG and loss of b wave (negative ERG) is final solution [37]. During infrared pupil perimetry combined with central 30 degree optic perimetry pupil motions are recorded simultaneously to diagnose retinitis pigmentosa. Typical narrow visual fields of retinitis pigmentosa and normal visual fields of simulators are easily discriminated with pupil perimetry [12,45]. On the other hand denial patient's visual acuity examination also helps diagnosis.

Binocular Vision Anomaly Denial Small angle squints and preoperated strabismus can be overlooked in simple examination. Stereopsis investigations (titmus fly test, fusion tests in synoptophore, Worth 4 dots test) can detect these problems.

Refractive Surgery Denial Refractive surgery is a counterindication for some professions like military aircraft pilots, policemen and military officers in some countries. Radial keratotomy, laser assisted in situ keratomileusis and intracorneal rings are easily diagnosed in silt lamp examination. But photorefractive keratectomy (PRK) and laser assisted subepithelial keratomileusis (LASEK) would be overlooked if no haze present. In those cases corneal topography indicates laser surgery if there is a central lower refractive zone compared to peripheral[3].

Reassuring the patient and patience seems to be elementary part of examination for simulation. Conversion cases wait patiently during long hours of examinations while malingerers object and get fury easily. This is one of indirect proves of malingering. When malingering diagnosis is made

smooth and understanding approach is advised. Direct explanations of malingering diagnosis and confrontation do not help ophthalmologist. Contrary it causes anger of malingerer and his/her relatives and unnecessary lawsuits and even attack of malingerer. Ophthalmologist must explain that he/she could not find elementary clinical signs of complaints and explains that complaints would disappear in time. This approach leaves to malingerer the second door of exit from complaints. Some malingerers accept this second door. On the other hand conversion cases easily and silently accept the diagnosis of conversion and thanks to ophthalmologist.

CONCLUSION

In today's world of ophthalmic practice, an ophthalmologist should have enough knowledge on simulation. Simulation in ophthalmology may manifest with a wide range of spectrum from conversion to malingering, latent strabismus to fixed dilated pupil, and Munchausen syndrome to refractive surgery denial. Malingerers either mimics some disorders or diseases, or deny existent pathology. It is not an easy task for an ophthalmologist who has to prove a diagnosis of simulation and to disclose it.

Probably, the best examination method to choose is the one that is used by the examiner efficiently and easily. There are mainly two types of tests for malingering: 1) Confounding. 2) Fogging. Sometimes both of them are used. Those tests are based on either subjective (patient-dependent) or objective (instrument dependent) evaluation. Examiner would preferably use the simplest and fastest one which he/she can perform easily. Among those, encouraging the patient, cylinder and prism tests for visual acuity assessment, Wernicke pupil test for hemianopia, Ishihara plates for color vision, dark room test for nictalopia, prism test, alternate cover, stereotest for amblyopia are the preferred and easy ones in ophthalmic practice. Examiner should not hesitate to hospitalize to follow the patient closely or to consult with other disciplines or to examine with sophisticated instruments, such as electrodiagnostic tests, OCT, dark adaptometry and anomaloscope when needed to obtain convincing evidence especially when needed for medicolegal or benefit cases.

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