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Research Article

Comparison applied of Fluorescein Dye and Fluorescein Dye-free in Eye Tonometry

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ABSTRACT

Introduction: IOP measurement is one of the significant stages of complete ophthalmology test. Goldmann applanation Tonometry is the most prevalent and concise method which is preferred by many ophthalmologists for measuring IOP. Considering problems followed by application of fluorescein dye which are important if pressure can be exactly measured by excluding fluorescein. This study deals with tonometry comparison by using dye and dye-free method.

Methods: In this research, 126 patients (252 eyes) were cases of study at Yasuj Eye Clinic on Feb. 2013. It was easy to pick sample cases and was self-witnessed. Gluacoma patients, children of below 15 years, people who had sunken eyes and tight eyelids anatomically and people who failed to help the researchers during tonometry were excluded from the study. All patients were measured randomly in their eye pressures of dye-included and dye-excluded.

Results: 55 women (44%) and 70 men (56%) were included in the study. The average age of under-study people was 30(±14.56). Average eye pressure of fluorescein dye-free equaled to 12.38±2.211 and of fluorescein dye was 12.94 ±1.96. Average right eye dye-included pressure was 12.98±1.830 and dye-excluded was 12.54±2.210. For left eye, the average dye-included pressure was 13.02±2.114 and dye-excluded was 12.43±2.215, none of which was insensible, statistically speaking.

Discussion: Fluorescein papers when used always create problems. A number of patients complain of eye irritation when receiving fluorescein paper in their eyes, particularly if it is done in haste. Included in the problems are sensitivity to fluorescein (though being less in degree) and infection-caused fluorescein paper.

As most of the existing articles in this respect trace back to untold years ago, a renewed study is required accordingly. The study showed that discrepancies from with or without fluorescein tonometry make no sense statistically but new and further studies seem necessary in this regard.

Keywords: Eye, Eye Tonometry, Fluorescein, Goldmann applanation,

INTRODUCTION:

Eyeball can be considered a closed area in which crystal fluid is continually flowing. The fluid preserves shape of eyeball and its fairly uniformed internal pressure. One of the important stages of ophthalmological examination is IOP measurement. Eye natural pressure is highly significant for healthy internal eye organs as IOP is assumed, according to a number of ophthalmologists, to be necessary for every person of upper 40 who visits the eye

clinic. If IOP results in eye internal neurons and increase cup-like troughs of optic nerve head or limited visibility, it is called glaucoma. Glaucoma is important in that it happens quietly and slowly but painlessly and it triggers serious destruction of internal eye nerve structures. More than 1,500,000 Americans are supposed to suffer from chronic visual disease, half of whom unaware of their disease (2). Blindness caused by glaucoma has affected about 10,000,000 people all over the world. Over 106 million people of the world are imagined to carry IOP (≥21mmHg) and almost 3 million people suffer from chronically angled glaucoma annually (1). Therefore, it seems clear that glaucoma is a major social and medical issue ad a proper assessment of eye pressure is important for diagnosing and deciding on the therapy model of glaucoma-carrying patients. The recent studies have shown that even 1mm eye pressure reduction can cause 10% of visibility destruction risk to come down and 10% of resultant therapy of increased eye pressure to recover (3-5).

Tonometry is a measurement method of eye internal pressure by using tools that make cornea vertex smooth and indent. It also contains different methods, each of which carry a variety of advantages and disadvantages. Thanks to accurate and easy application, Goldmann Applanation Tonometry is the most common and concise method preferred by a lot of ophthalmologists for measuring IOP. In this method, fluorescein dye and cobalt blue light have been applied for measuring IOP. Regarding the problems followed by fluorescein dye application (such as eye irritation), possible sensitivity, itchy eyes, infection and problems of provision and the related expenses), what is important is if IOP can be measured carefully and accurately without fluorescein being applied. This study has dealt with Goldmann Applanation Tonometry in prevailing method (by using dye) and dye-excluded tonometry.

MATERIALS AND METHODS

In this research, 126 patients (252 eyes) were examined at Shahid Mofatteh Ophthalmology Clinic in Yasuj city on February 2013. Patients were picked in easy sampling and self-witnessed. Patients carrying glaucoma, children under 15 years, people having sunken eyes and tight eyelids anatomically failed to meet the requirements of the study. Also, patients denying help during tonometry were excluded from the study. One bio microscopic system equipped with fixed tonometer of the HAAG-STREIT type available at the clinic was always used for measuring pressures and all pressures were measured by one ophthalmologist. Every patient underwent random measurement of one eye IOP through fluorescein dye and another eye without fluorescein dye. For the purpose, the patient stood behind the lamp slit after receiving anesthetic drops in both eyes. The pressure of the eye needless of dye was first measured by Goldman applanation Tonometer and the pressure of the other eye was measured by applying sterile fluorescein paper and cobalt blue light and finally the data were registered in the questionnaire. After being coded through SPSS version 22 and non-parameter statistical test, the data had been analyzed. Sensible $P \leq 0.05$ is considered.

RESULTS

55 women (44%) and 71 men (56%) were cases of the study. Average age of the cases stood at 30(±14.56). The information related to degree of eye pressure in various groups and their comparison is given in tables 1.

Table 1. Comparison of Eye Pressure –fluorescein Dye and Dye-free for Patients at Shahid Mofatteh Eye Clinic in Yasuj, February 2013

Pressure/mmHg	Frequency	Mean± SD	Statistical test
Right Eyes Pressure/Dye-Included	63	12.98±1.830	T= 1.24, P= 0.19
Right Eyes Pressure/Dye Excluded	63	12.54±2.310	N.S.*
Left Eyes Pressure/Dye-Included	63	13.02±2.114	T.= 1.42, P= 0.09
Left Eyes Pressure/Dye-Excluded	63	12.43±2.215	N.S.
Total Eyes Pressure/Dye-Included	126	12.94 ±1.96	T= 1.34, P= 0.12
Total Eye Pressure/Dye-Excluded	126	12.38±2.211	N.S.
Total Eyes	252	12.75 ±2.06	----------

- Not Significant.

DISCUSSION AND CONCLUSION

Goldman Tonometer-based eye pressure measurement is one of the most important examinations and the foremost made in every eye clinic. As earlier said, for measuring eye pressure, anesthetic fluorescein soluble, and fluorescein soluble alone or fluorescein papers are used. Application of fluorescein papers always leads to problems. Many patients complain of felling of eye irritation when fluorescein papers are placed into the eye, particularly if done by a physician hastily and carelessly. Sensitivity to fluorescein (even though less in degree) and infection-caused fluorescein paper are among the problems. Most of the clinical ophthalmologists have experienced their lack of access to fluorescein paper for a short time (2-6). Because of this, they have not measured the patient's eye pressure or they were inclined to do so but they really did not know how accurate the fluorescein-free eye pressure measurement could be. This research intends to answer the above question by comparing fluorescein-included or fluorescein-excluded eye pressure measurement. This article writers pursuing the accredited journal sites are faced with few articles, if any, associated with the issue, some of which are given herein. In a study conducted by Daniel Rapper and et al (6) at the Ophthalmology Department of USAF district hospital in Florida State of the United States in 1980, two groups of 25 people (50 eyes) were the cases. In group A, after taking proparacaine HU in both eyes, eye pressure is measured first by white light and dye-free. Immediately afterwards, lower conjunctiva sac is dyed by the ready-made strip-saturated fluorescein and the eye pressure is measured by cobalt blue light. In this group, averagely measured pressure in fluorescein-free eyes stands as 11.1±3.41mmHg compared to the average pressure of 12.78±3.29mmHg in the eyes dyed with fluorescein paper strips. In $P \leq 0.05$, mean discrepancy differed considerably. In group B, there are 25 patients (50 eyes). In this group, pressure of both eyes has been recorded by white light when dye is excluded. Then, both eyes receive one drop of ready-made compound of sodium fluorescent soluble of 25% and chloride hydrogen bioxynate and cobalt blue light tonometry is exercised. In group B, averagely measured pressure is 17.34±4.07 in the eyes measured by fluorescein compound-anesthetic soluble. Mean discrepancy in $P \leq 0.001$ is 5.62mmHg which turns sensible considerably. This study observed that insufficient fluorescein led to no distinctive concave crescent edge of cornea. As a result, thick part of concave crescent is visible assure and tonometrical area is less than 3.06mm, so eye pressure is reportedly less than what it actually is. Also, the remarkable point in this study is that most of the local anesthesia has weakened acidity which tends to control fluorescence in fluorescein dye. For this, if anesthetic drop is applied for moistening of saturated fluorescein in ready-made strips, fluorescein is removed noticeably, with the effect as though no fluorescein has been applied whatsoever.

In a study carried out by Michael Ramlet and et al (4) on consecutive 100 eyes, fluorescein-free pressure first and then with fluorescein has been measured. In this study, in every patient, eye pressure mercury of 3-10mm stands averagely lower than actually reported degree and fluorescein is necessary to exist. Bright and et al (5, 6) conducted a study in order to determine the impact of fluorescein-excluded Goldmann Applanation Tonometry in 1981. According to accidentally preplanned program, 200 patients are studied sequentially and fluorescein-undyed firstly and then fluorescein-dyed tonometry has been imposed. Mean discrepancy of findings obtained from fluorescein-included and fluorescein-excluded tonometry came to be 7mmHg. Besides, fluorescein is not applied in Goldmann Applanation Tonometry resulting in pressure measurement being lower than the real degree and a mistake is made during measurement. Finally, the increased pressure led to incremented glaucoma, ruined vision nerve and reduced visibility. In a study by Frank Winstuk (8,7), no differences are observed between white light tonometry excluding fluorescein and blue light tonometry including fluorescein, but the study revealed that blue light tonometry with fluorescein is easier and since anesthetics is applied for tonometry, anesthetics containing fluorescein had better be applied so

that an improved cornea vision might be resulted. In another study by Ramond Smith (9-12) in Bermuda, no considerable discrepancy is observed in pressure obtained from white light and blue light tonometry with fluorescein. The study witnessed that pressure obtained from tonometry is also different as regards to varied thickness of cornea from being dyed; the more thickness, the more pressure is obtained. Raymond holds that fluorescein-free tonometry has come to be satisfactory in many years and no difference exists by applying fluorescein method. This method keeps away from disadvantages of fluorescein, believing that cornea loses its natural shape if fluorescein is overused.

As seen, most of the existing articles (12- 16) in this respect go back to the past years and no renewed study has been conducted. This study reveals that discrepancy obtained from fluorescein-included and fluorescein-excluded tonometry is statistically insensible, yet new and further studies seem necessary.

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CONFLICT OF INTERESTS

The authors declare that they have no competing interest

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