



New Approach In Binocular Single Vision Assessment For Candidate Of Phacoemulsification Micro Surgeons

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ABSTRACT

Purpose: To determine new approach in Binocular Single Vision (BSV) assessment for candidate of phacoemulsification micro surgeons

Methods: All subjects were examined with general ophthalmology examinations and must be passed 20/20 Best Corrected Visual Acuity (BCVA) in first step. In second steps, subjects will be examined with Worth Four Dot Test (WFDT) in Distance and Near, Uncover Test, Maddox Rod and Titmus (Dots and Fly). Then in third steps, subjects who passed second tests were examined by two modification tests under operating microscope

Results: 144 subjects were passed first step examinations and had 20/20 Binocular Best Corrected Visual Acuity (BBCVA). In second steps 126 subjects passed the tests of WFDT in Distance and Near, Uncover Test, Maddox Rod and Titmus (Dots and Fly). Those subjects underwent third steps examinations using Titmus test under operating microscope and combination of pointing and grabbing multicolour beads under operating microscope

Conclusion: Titmus test under operating microscope and combination of pointing and grabbing multicolour beads under operating microscope may sharpening the BSV assessment for candidate of training phacoemulsification micro surgeons

Keywords: binocular single vision, BSV, phacoemulsification, micro surgeons

INTRODUCTION

Binocular single vision (BSV) is important ability to perform successfully micro surgery. Good binocular single vision can absolutely enhance result and quality of several under optical assisted micro surgeries.¹⁻⁴ According to those reasons there is assumption that candidates of training ophthalmic surgery must pass many tests of BSV to assure their complex ability and successfully in training to be phacoemulsification surgeon. It must be performed beyond basic tests of knowledge and academic performance.⁵ Cataract surgery now has new paradigm as surgery with high accountability in visual function, and cataract patients will benefit from better and safer outcomes.⁶

Stereopsis is highest level in binocular vision. Several tests nowadays can distinguish

between normal binocular vision with some cases of binocular vision problems such as diplopia, suppression, phoria, and small disorder of depth perception. Many test can be perform to reveal, we know and use it for years. Many of them are WFDT in Distance and Near, Uncover Test, Maddox Rod and Titmus (Dots and Fly).⁷⁻¹⁰

WFDT can distinguish some normal binocular vision from diplopia and suppression. Uncover test can distinguish orthophoria with any phorias. Maddox rod even can detect small degree of fusion problem, meanwhile Titmus can help ophthalmologists to assess any conditions of stereopsis, depth perception and 3D vision.¹¹ According to the outcome and result of surgery, those all respectfully need some modification to assure that a candidate can be eligible as training phacoemulsification and micro ophthalmic surgeon, surely being able to undergo all training program and being smooth to perform their own successfully micro surgery in the future.

METHODS

This is a cross sectional study to collect some data in binocular single vision ability to seek any new approach or models in sharpening the binocular single vision assessment for candidate of training phacoemulsification and micro ophthalmic surgeons. Each step compared with the next consecutive step with paired t-test. The level of significance was set at $p < 0.05$.

First step tests were using the same methods in assessment of general examination. All subjects were examined in visual BCVA using Snellen's

chart projector. Non contact tonometer was deployed to exclude subjects with abnormal intra ocular pressure. In second step tests, same instruments of WFDT in Distance and Near, Uncover Test, Maddox Rod and Titmus (Dots and Fly) examinations were performed following the screening examinations to separate subjects with abnormality in BSV.

Subjects with normal BSV examinations underwent several continued third steps tests using Titmus test under operating microscope and combination of pointing and grabbing multicolour beads under 2 (two) kinds of operating microscopes (Inami L-0940 Deca-21 Portable Operating Microscope and TopCon OMS 710 Stand Operating Microscope). Subjects with abnormality in BSV also underwent same third steps tests.

The criterion of WFDT is must be normal without diplopia and suppression. Criterion of Uncover test and Maddox Rod must be normal without any phorias and deviations. The passing criterion of Titmus, subjects must be able to grab the fly's wings and can distinguish depth perception of dots in 160-240 second of arc. And the passing criterion of combination of pointing and grabbing multicolour beads is can determine beads configuration in depth and grab all beads consecutively from deepest position of beads to most shallow beads using standard tying forceps by right and left hands.

RESULTS

144 subjects were passed general examinations and had 20/20 Binocular Best

Corrected Visual Acuity (BBCVA) as first step examinations. In second steps 126 of 144 subjects (87.5%) passed the tests of Worth Four Dot Test (WFDT) in Distance and Near, Uncover Test, Maddox Rod and Titmus (Dots and Fly) and 18 of 144 subjects (12.5%) failed the tests ($p=0.000$) (Figure 1).

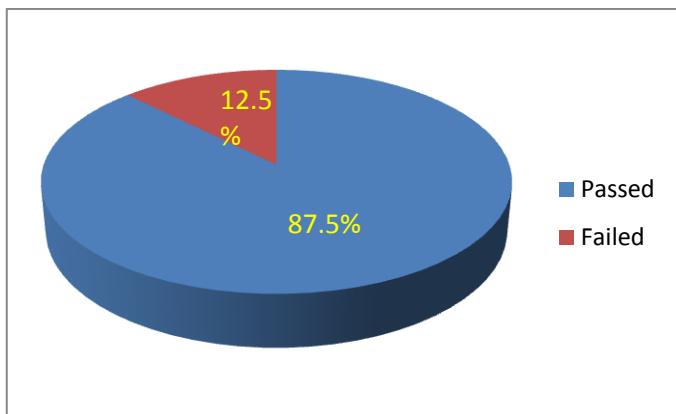


Figure 1. Result of the Second Tests of Worth Four Dot Test (WFDT) in Distance and Near, Uncover Test, Maddox Rod and Titmus (Dots and Fly)

In third steps, those subjects underwent continued examinations using Titmus test and combination of pointing and grabbing multicolour beads under operating microscope.

In this third steps, 92 of 126 subjects underwent examinations of Titmus and combination of pointing and grabbing multicolour beads under Inami operating microscope (Group A). The results are 66 of 92 subjects (71.74%) passed test and 26 of 92 subjects (28.26%) were failed ($p=0.000$) (Figure 2).

In the other hand, 34 of 126 subjects underwent examinations of Titmus test and combination of pointing and grabbing multicolour beads under TopCon operating microscope (Group

B). And the results are 29 of 34 subjects (85.29%) passed test and 5 of 34 subjects (14.71%) were failed. ($p=0.000$) (Figure 2)

The passing percentage in third steps of test was 1.188 times higher in the use of Topcon Operating Microscope than Inami ($p=0.04$) (Figure 2). All of 18 (100%) subjects who failed the second steps tests of BSV were also failed in third steps of tests under operating microscope ($p=0.000$)

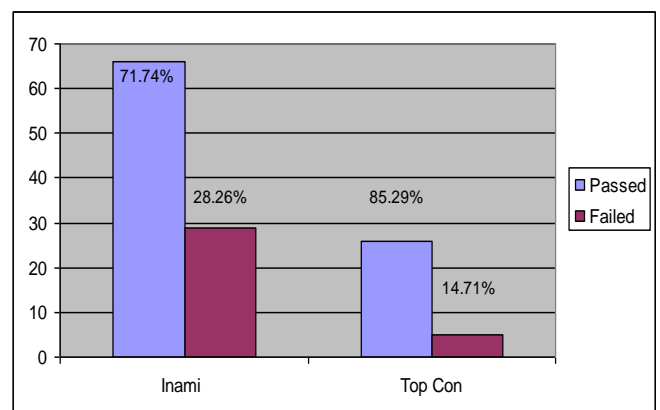


Figure 2. Result of Third Tests using Titmus Test and Combination of Pointing and Grabbing Multicolour Beads under Operating Microscope

DISCUSSIONS

In this era, phacoemulsification tends to be ultimate refractive surgery.¹² Simple creative and applicable efforts must be done to avoid all risks and unexpected events by residents to perform phacoemulsification. It needs some ultimate skills and abilities of surgeons to perform beyond any available sophisticated instruments and technologies.¹³ Potential candidates with better binocular single vision tend to do better performance in their skill and ability in detailed work such as LASIK, keratoplasty,

phacoemulsification, micro incision cataract surgery (MICS), pars plana vitrectomy and any other micro ophthalmic surgeries.

The tests of Worth Four Dot Test (WFDT) in Distance and Near, Uncover Test, Maddox Rod and Titmus (Dots and Fly) could be performed as first line screening tests in BSV. These tests used to be standard tests to distinguish any anomalies in BSV (Figure 1).

In this study, we found that not all subjects who passed second steps of BSV tests can pass the third steps. Many subjects failed to pass third steps examinations. It indicates that by using operating microscope, binocular vision faces different condition and become more complex (Figure 2).

This indication was amplified with those all 18 subjects (100%) who failed to pass second steps of test, that were also failed in third steps of tests under operating microscope ($p=0.000$). No subjects were success to pass the tests.

Higher specification of operating microscope was indicated here that increased the ability of binocular vision. Data shows that passing percentage in third steps of test was 1.188 times higher in the use of Top Con Operating Microscope than Inami ($p=0.04$) (Figure 2).

However the higher specification of the operating microscope, such as lens quality due to ability in magnification, zoom and micro focus, X-Y performance, pedal control, illumination, etc would have any advantages to enhance surgeon's binocular vision.

Catching a ball with one hand requires both monocular and binocular clues and has been fairly extensively studied.^{14,15} Modified test of

combination of pointing and grabbing multicolour beads can indicate ability in stereopsis, depth perception or 3D vision and predict the ability in psychomotor integration between eyes and arms movements. Using of standard tying forceps to grab the beads under operating microscope will make sure that candidate has good coordination among eyes with right and left hands to do any micro maneuvers. This condition is useful in performing any better training and practice to wishfully achieve any excellent result in phacoemulsification and any ophthalmic micro surgeries.

Nowadays demand of stereoscopic vision is recognized by the development in virtual 3D image surgery which is viewed to perform any kind of surgery by guide any instrument maneuvers more accurately.¹⁶⁻¹⁸ Testing stereopsis in talented trainees as an important measure of microsurgical skill is not supported by the evidence so far, but it may be advantageous for those contemplating a career in ophthalmology to be aware of their own depth perception and coordination, as ophthalmic surgery is visually demanding and requires very smooth motor skills.¹⁹⁻²¹ Hopefully all these new approach can help the education system to make better ophthalmic service in the future.

New methods of examinations using Titmus test under operating microscope and combination of pointing and grabbing multicolour beads under operating microscope can enhance binocular single vision (BSV) assessment for candidate of phacoemulsification micro surgeons. These examinations may be useful to be done beyond tests of Worth Four Dot Test (WFDT) in Distance and

Near, Uncover Test, Maddox Rod and Titmus (Dots and Fly)

Combination of pointing and grabbing multicolour beads under operating microscope exclusively can enhance binocular single vision (BSV) assessment and simple psychomotor assessment for candidate of phacoemulsification micro surgeons.

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