

Commentary: Impact of stereoscopic vision on converting virtual reality to the real-life environment: Way forward to train the novice ophthalmic microsurgeons

Stereopsis is the ability to perceive the visual objects in depth (in the third dimension), which occurs when horizontally disparate retinal images are stimulated simultaneously. The fusion of such disparate images results in a single visual impression perceived in as depth. It has been now more than three decades, the real significance of stereoscopic vision was questioned, and today it is evident that it is crucial for visuomotor coordination and fine and precise task in our day to day life.^[1] Stereopsis is disrupted by blur (refractive error), amblyopia, and strabismus due to the inability to form high-quality foveal images in both eyes. Refractive error is the most prevalent ocular pathology in the general population, and uncorrected anisometropia is seen frequently.^[2] The graded increase in anisometropia, there is a proportionate decrease in stereoacuity, which has been proven without a doubt by several studies on the effect of experimental anisometropia and stereopsis.^[3] Acquired anisometropia, leading to monovision, can be therapeutic or iatrogenic. We have used it, especially for presbyopia treatment, with contact lenses, refractive surgery, and Iatrogenic anisometropia can occur even after any intraocular surgical procedure.

Having understood the stereoscopic vision and the effect of anisometropia, we can take advantage of this faculty of stereopsis for professions like ours as an ophthalmic surgeon, requiring heightened visual function and good hand-eye coordination. In today's world, with the emergence of virtual classrooms, 3D movies, and games, the training in ophthalmology surgery has shown a paradigm shift from pure apprenticeship towards surgical simulators and wet laboratories.^[4] Multiple studies have shown that surgical simulators help to shorten the learning curve of the residents, decrease surgical morbidity by reducing the risk of iatrogenic trauma to ocular tissues, and overall surgical performance in ophthalmic surgery like phacoemulsification.^[4,5]

There have been instances of questioning the accuracy of the simulation of tissue anatomy, no objective assessment,

repeatability, and reproducibility.^[6,7] This has been addressed to a greater extent by the recent development of computer simulators like VRmagic EYESiOphthalmosurgical Simulator (VRmagic Holding AG, Mannheim, Germany). This device provides a real-life situation using the virtual reality technique along with didactic instructions.^[7]

There are no studies that evaluate the impact of uncorrected anisometropia on the stereopsis of these patients and their ability to perform the delicate task. In this issue of the journal, Singh *et al.* tried to address this by studying the anisometropia induced loss of stereopsis with its effect on tasks that require binocular vision and stereopsis, such as ophthalmic surgery in a simulated environment. The authors recommend that refractive correction is of paramount importance for ophthalmic surgeons because even 1D of anisometropia leads to a drop in surgical scores in a simulated virtual environment. It would also be prudent to include stereopsis as a regular part of the screening procedure for candidates pursuing professions that require skilled and delicate visuomotor tasks.^[8]

To put things in perspective, Singh *et al.*'s study does show the statistically significant deterioration with increasing values of each diopter of induced anisometropia for spherical as well as cylindrical lenses. However, the results of this study have to be carefully interpreted in the background of the small sample size; results might vary in cases with long-standing uncorrected anisometropia. Also, the impact of aniseikonia due to higher anisometropia, and the most important is the measurement of surgical task scores in a simulated environment can predict but not precisely reproduce the measuring surgical proficiency in a real-life situation.

In the context of surgical training of ophthalmology residents in India, this study would highlight the importance of possible use of the virtual reality to improve the performance of ophthalmic surgeries by increasing the skills of the novice residents and shortening their learning curve. The future is not far away from establishing a single wet laboratory center with virtual reality simulators at a regional institute of ophthalmology in every state considering the cost, time, and resources. This wet lab center could cater through the skill transfer program for the medical colleges in rotation during the first years of their residency program.

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