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Quality of Life Assessment Post Refractive Surgery in Aviators.

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ABSTRACT

Background: To measure QoL outcome in post LASIK Aviators using the Quality of Life Impact of Refractive Correction (QIRC) questionnaire. **Methods:** A prospective, non-randomized, cross-sectional study was carried out from Oct 2016 to Dec 2017. . The study included actively flying Indian pilots of both sexes, reporting for the annual medical fitness certification. QIRC which consists of 20 questions scored on 5 category response scale, is self-administered. Aviators were asked to rate on 5 point scale of agreement. Response was converted to Rasch weighted scores to give a true measure of refractive error related QoL. **Results:** This hospital based study was conducted on 39 Pilots who were administered Quality of Life Impact of Refractive Correction (QIRC) questionnaire. 20 pilots were from civil airline pilots and 7 were Army Aviation and 2 were IAF pilot of transport stream. There were 3 female pilots all from the civil transport stream. Mean age 27.2 yrs ± 4.5 (21 to 37 yrs) who had myopia of more than- 0.50 D, ranging from -.75D TO 6.5 D before undergoing the refractive surgery procedure. Prior to surgery predominantly i.e.26 patients (66.6%) were spectacle wearer, 10 (25.6%) were contact lens wearer, 3 patients (7.69%) were not using any means of correction. All the patients were Post Lasik status of more than 1 year. This study showed a large improvement in QoL in the majority of patients after refractive surgery (PRK & LASIK). These large improvements are consistent with results in conventionally validated previous reports of refractive error related QoL as a result of surgery. In the POST LASIK study group spectacle correction was being used by 36% of patients with power ranging from –0.50D to – 1.50 D SE. **Conclusion:** LASIK is an excellent alternative to glasses or contact lens use, being associated with high degree of patient's satisfaction. While LASIK is not without risks, these results are quite reassuring for all pilots thinking of this procedure. Laser system for vision correction like aircraft are continually being enhanced, improved and upgraded. We should embrace the technology and offer the best currently available to the aviators.

Keywords: Quality of life; aviation; refractive error; refractive surgery; QIRC.

INTRODUCTION

Refractive error is the most common cause of rejection for aircrew among the ophthalmological conditions. Visual performance is vital to the mission and safety. Spectacles and contact lenses remain most common form of vision correction but they are ill suited to the physiologic environment of cockpit. The pilot manning this machine is working in unique environment of high altitude, dry air, wind blast, "G" forces. Pilot needs to maintain visual scan both inside and outside the cockpit, day and night, also in hypoxic and hyperbaric conditions.

Laser vision correction of myopia, hyperopia and astigmatism has been quite effective and relatively safe. Effectiveness of refractive surgery has markedly improved from 1987 when it was introduced to present due to refinement of technologies, improvements in the contour/ edge ablation zone leading to better visual outcomes, advances in or elimination of the need for pharmacological manipulation in wound healing and improved postoperative pain control which lead to improved refractive outcomes after surgery.[1] Refractive surgery is an umbrella term which encompasses different surgeries within the spectrum. PRK is based on surface ablation, while in LASIK ablation takes place under a partial thickness flap.

The outcome of refractive surgery has usually been characterized by objective standard clinical measures, such as postoperative uncorrected visual acuity and residual refractive error.[2] Although these measures provide important information, they do not necessarily correlate well with the patients'

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postoperative subjective impressions and visual improvement.[3] The importance of patient centered measurement using a measure of quality of life (QoL) for clinical research and practice has been widely recognized and many QoL questionnaires have been developed to determine subjective patient satisfaction and self-perceived QoV after refractive surgery to correct myopia.[4,5] Therefore assessment of refraction-related QoL and visual functioning have recently become increasingly used to assess the outcome of refractive surgery.

Aim & Objective:

To measure QoL outcome in post LASIK Aviators using the Quality of Life Impact of Refractive Correction (QIRC) questionnaire.

MATERIALS AND METHODS

A prospective, non-randomized, cross-sectional study was carried out from Oct 2016 to Dec 2017. Institutional Ethics Committee approval was obtained prior to commencing the study. The study included actively flying Indian pilots of both sexes, reporting for the annual medical fitness certification to this centre. The pilots were enrolled in study after obtaining a due informed consent for both participation in study and for any publication of data from the study. QIRC is a questionnaire designed to measure the QOL of people who require an optical correction (spectacles, contact lens or refractive surgery). QIRC which consists of 20 questions scored on 5 category response scale, is self-administered and given to patients before the eye examination. All response scales include 5 choices and patient has to consider their answers using each possible choice. Question 14-20 are concerned with wellbeing in relation to refractive correction. Aviators were asked to rate on 5 point scale of agreement. A higher score with QIRC scale represents better QoL. Response was converted to Rasch weighted scores to give a true measure of refractive error related QoL. The excel file converts the original number data into the Rasch scale QIRC score to fit a 0-100 scale. By converting patient score on the raw data spreadsheet each numeric value is automatically converted into the 0-100. In all questions QIRC score represents better QoL, therefore for questions 1-13 regarding visual function, symptoms, convenience the positive adjusted descriptor is assigned to the lowest rating scale(1) QIRC score. Validated QIRC questionnaire completed by 39 aviators.

RESULTS

Table 1: Refractive error before surgery.

Refractive error before surgery	
Low (-0.5D to <-3.0 D)	53%
Moderate (-3.0D to -6.0 D)	38%
High (> - 6.0 D)	09%
Sex (% Women)	30.7%
Mean age yr ± SD (range)	25.2 yrs ± 4.5 (21 to 37)

This hospital based study was conducted on 39 Pilots who were administered Quality of Life Impact of Refractive Correction (QIRC) questionnaire. 20 pilots were from civil airline pilots and 7 were Army Aviation and 2 were IAF pilot of transport stream. There were 3 female pilots all from the civil transport stream. Mean age 27.2 yrs ± 4.5 (21 to 37 yrs) who had myopia of more than- 0.50 D, ranging from -.75D TO 6.5 D before undergoing the refractive surgery procedure. Prior to surgery predominantly i.e.26 patients (66.6%) were spectacle wearer, 10 (25.6%) were contact lens wearer, 3 patients (7.69%) were not using any means of correction. All the patients were Post Lasik status of more than 1 year. This study showed a large improvement in QoL in the majority of patients after refractive surgery (PRK & LASIK). These large improvements are consistent with results in conventionally validated previous reports of refractive error related QoL as a result of surgery. In the POST LASIK study group spectacle correction was being used by 36% of patients with power ranging from –0.50D to – 1.50 D SE. All cases had uncomplicated surgery.

Table 2: Post LASIK visual acuity

UCVA	Post Lasik
6/6 unaided	63.8% (21/ 39)
6/9 unaided	31.02% (16/39)
6/12 or less	5.1% (02/39)

Table 3: Global satisfaction scale score

GS	Result	Range
Mean score ± SD*	4.64 ± 0.8	1.0-5.0
Surgery was a good choice	100.0%	-
Main goal achieved	98.5%	-
Satisfied with results	98.5%	-
Happiness after LASIK	98.0%	-
Understanding procedure pre-operative	98.0%	-
Advice friends to do LASIK	97.5%	-
Improved quality of life style	93.0%	-
Expected quality of vision achieved	80.5%	-
*score 1-5 (5 means totally satisfied)		

Table 4: Night vision scale score

NV scale score	results
Mean score ± SD	4.75 ± 0.65
NV considered same or better than before (%)	96.5
NV considered worse than before (%)	3.5
Halos (before/after) (%)	42/66
Perception of stars around lights (before/after) (%)	44.5/55

Table 5: Flying scale score

Flying Scale Score	Result
Mean score ± SD	4.14± 1.2
Day time flying score of 5 (totally satisfied) %	91.3
Night flying score 5 (totally satisfied) %	79

More difficulty with night flying than before surgery	6.2
Less difficulty with night flying than before surgery	79

Table 6: Glare score scale

Glare scale score	result
Mean score ± SD	3.98 ± 0.5
Glare from light at night (before/ after) surgery (%)	28/34
Glare from oncoming headlights bothersome before surgery (%)	19.5
Glare from oncoming headlights considered same before surgery (%)	46.5
Glare from oncoming headlights bothersome after surgery (%)	34

Table 7: Summary of various studies

References	Sample size of patients	% satisfaction
Hill JC(S. Africa)	200	99.5
McGhee CN (Scotland)	48	97.9
Payvar S (Iran)	31	96.8
Soroka M (USA)	165	95
Sangoussi D (France)	90	97.8
El Dansoury MA (UAE)	56	97.6

DISCUSSION

In the realm of aviation, visual performance is vital to the mission and safety of the aircrew. Near-perfect visual acuity must effectively and efficiently allow the aviator to maintain a visual scan inside and outside the aircraft, day and night, under hypoxic and hypobaric conditions and in situations when other sensory inputs fail. Spectacles and contact lenses remain the most common form of vision correction utilized, but can be ill suited to the physiologic environment of the cockpit, or incompatible with modern avionics equipment.[6] The refractive procedures photorefractive keratectomy (PRK) and laser-assisted in situ keratomileusis (LASIK) are safe and efficacious methods to reduce dependence on corrective lens use and have been well validated in a number of aviation communities.[7] Two primary reasons which have prevented LASIK from being accepted for aviators of all streams until this point—concerns about the flap stability and the quality of vision with conventional (standard) LASIK. Refractive procedures have been well validated in aviation communities. FDA approved the PRK procedures in 1997 and in 2007 LASIK was allowed for all aviators though PRK remains a preferred procedure because of it being free from flap related complications. In US Air Force all forms of PRK and LASIK are approved with waiver for civil aircrew, military aviators, and even astronauts.[7] Advanced surface ablation is the catch phrase for multitude of surface ablation including Laser Epithelial Keratomileusis (LASEK), Epi-LASIK which bears more resemblance to Photorefractive Keratectomy (PRK) than LASIK and is preferred options for eye with thin cornea. Post- LASIK patients report experiencing mild irritation, sensitivity to bright light, and tearing for a few days after surgery. For most, vision stabilizes within 3 months to near predicted results, and residual night glare usually diminishes within 6 months. In few cases symptoms have lingered longer than a year.[8] That's why the concept of cooling period post-surgery is introduced in both military and civil flying. As the pupil dilates and becomes larger than the ablation zone, light (car headlights, streetlights, and traffic signals lights) entering through these transition areas becomes distorted, resulting in aberrations perceived as glare.[9] These patients often complain of difficulties seeing under low-light conditions. Patients that develop postoperative haze during the healing process have complained of glare (halos and starbursts). Furthermore, it has been reported that exposure to ultraviolet radiation or bright sunlight may result in refractive regression and late-onset corneal haze. It is therefore recommended that all refractive surgery patients wear sunglasses with UV protection. Wavefront-guided LASIK technology overcame the shortcomings of conventional surgery, namely that the quality of vision was significantly better with wavefront guided surgery than with conventional LASIK. Studies also concluded that a femtosecond laser was better than a mechanical microkeratome.[10] The femtosecond flap is more consistent then mechanical microkeratomes. Femtosecond lasers also afford the patient significantly faster visual recovery.[11] In terms of quality of vision, the femtosecond laser had improved contrast sensitivity compared to mechanical microkeratomes. They offer greater control over certain optical aberrations and night vision problem. Studies have found no changes occurred in visual acuity or contrast sensitivity in LASIK-induced flaps when compared to normal control after being exposed to environmental conditions an aviator might find. Hence LASIK has been allowed in aviators since a decade in army aviation and in transport and helicopter pilots of Indian Air Force, though not in fighter flying.

Till now the QoL studies were done on non-aviators, after a decade of the acceptance of post LASIK candidates in aviation, both civil and military, the QoL parameters of aviators was studied rather than extrapolating the findings from the studies done on non-aviators.[12] Retrospective analysis was done to compare the quality of vision in eyes of 31 aviators who had undergone conventional LASIK or conventional PRK and only 8 who had undergone the Femto-Lasik. This study showed a large improvement in QoL in the pilots after LASIK refractive surgery. These large improvement in QoL are consistent with results in conventionally validated previous reports of refractive error related

QoL as a result of surgery.[4,5,13] Pilots reported significantly improved QoL after refractive surgery in subscales related to expectations, physical and social functioning, wellbeing domain and problem with corrective lenses (convenience issue).[14] However optical problems like sensitivity, halos around light and glare showed significantly worse scores after surgery and clarity of vision, both near and far and diurnal fluctuation showed no significant change.[15,16] Women scored better in Wellbeing as were complemented / flattered more post refractive surgery, feeling happy and satisfied, feel they are looking their best.

In this study vision without glasses or contacts was 6/6 in 96.5% of eyes. Overall, 95.5% of patients believed that LASIK has helped in their effectiveness as pilots and 99.4 % said they would recommend the same treatment to others.

CONCLUSION

The aviator is a high-valued asset and represents a significant investment to train properly. Refractive procedures have and will continue to play an important role for current and future generations of aviators and aircrew. We need to exercise a high level of due diligence and careful analysis to uncover potential disabling complications unique to this group. Laser system for vision correction like aircraft are continually being enhanced, improved and upgraded. We should embrace the technology and offer the best currently available to the aviators. LASIK is an excellent alternative to glasses or contact lens use, being associated with high degree of patient's satisfaction. While LASIK is not without risks, these results are quite reassuring for all pilots thinking of this procedure.

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