

## Femtosecond Laser Assisted Cataract Surgery's Efficiency and Safety Utilising Egypt's First Femtosecond Laser Platform

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### ABSTRACT

**Background:** Ten years was passed since the first Femtosecond Laser Assisted Cataract Surgery (FLACS) platform was introduced to the Egyptian market with hope for cataract patients.

**Objectives:** To report and assess femtosecond laser assisted cataract surgery's efficiency and safety utilizing Victus femtosecond laser platform used in the Egyptian market.

**Patients and methods:** This retrospective investigation was conducted at a private facility that has Egypt's first FLACS platform. It was conducted 10 years ago on 20 eyes that had cataract grade III. For them Femtosecond laser assisted cataract surgery was done using Victus Femtosecond Laser Platform (Technolas Bausch and Lomb). 20 eyes were planned as a control group utilizing conventional cataract extraction. Preoperative slit lamp examination, best corrected visual acuity and endothelial cell count were done and repeated postoperatively. Main outcome measures contained visual acuity and endothelial cell count. Data were collected and analyzed statistically.

**Results:** Regarding postoperative visual acuity it was significantly better with FLACS and improved after one week and one month, beside that endothelial cell loss was less with it.

**Conclusion:** In comparison to traditional cataract extraction, femtosecond laser assisted cataract surgery (FLACS) using the Victus femtosecond laser platform was a successful and secure technique.

**Keywords:** Cataract, Femtosecond laser, Efficacy, Safety.

### INTRODUCTION

The primary contributor to blindness as well as the second most commonly observed reason responsible for moderate to severe visual impairment on a global scale in 2020 still cataract. It adversely affects a population comprising 15.2 million individuals with blindness and 78.8 million people experiencing visual impairment [1]. Cataract surgery is widely regarded as one of the most successful treatments in the field of medicine [2].

According to historical records, the earliest documented attempts at performing cataract surgery occurred in ancient Egypt. Surgeons at that time employed a needle to puncture the eye and remove the opaque lens. This surgical technique was also adopted by the ancient Greeks and Romans, and was carefully described by the renowned physician Galen in his written works [3, 4].

Over the years, there have been numerous advancements in the techniques and technology used in cataract surgery, transforming it from a mere surgical remedy for cataracts to a refractive procedure. As a result of these advancements, cataract surgery now offers much more than just the removal of cataracts [2].

In 2008, the first version of the cutting-edge procedure known as femtosecond laser-assisted cataract surgery (FLACS) was created [5]. The femtosecond laser is a solid-state laser that operates at a wavelength of 1.053 nm, which is capable of photodisruption in ocular tissues by delivering ultrashort femtosecond pulses ranging from 200 to 800 fs, with less damage in collateral tissue and achieve more precise impact with lower energy per pulse

[6]. The mechanism of tissue separation is achieved in two ways: ablation and cleaving, with laser parameters determining the chief mechanism based on the pulse energy. It has already been established that the femtosecond laser permits the planning and regulation of the capsulotomy's size, shape, and alignment, as well as the positioning and three-dimensional features of the access incisions [7, 8].

The use of Femtosecond laser-assisted cataract surgery, facilitated by the advanced Victus platform, is a contemporary method of enhancing the accuracy and safety of cataract surgery that was introduced to the Egyptian market 2013 [9].

### AIM OF THE WORK

To recognize the effectiveness and safety of Femtosecond laser assisted cataract surgery using the 1<sup>st</sup> machine applied to the Egyptian market.

### PATIENTS AND METHODS

Using the first femtosecond laser platform (Victus) (Technolas Bausch and Lomb) that was introduced to the Egyptian market on 2013, we conducted a retrospective investigation in a private facility in Cairo ten years ago. FLACS was performed for 20 eyes of 20 patients suffering from cataract grade III while another 20 eyes having the same criteria conventional cataract extraction was done for them by the same surgical team and recognized as the control group (Figures 1-6).

**Inclusion criteria:** Patients' age ranged from 50 to 60 years old, not suffering from any systemic diseases, have senile cataract grade 3 according to Lens Opacity Classification System (LOCS). Their preoperative visual acuity ranged between 0.1 and 0.15, with their endothelial cell count over 2200/mm<sup>2</sup>.

**Exclusion criteria:** Complicated cataracts or any case that has complication during the procedures.

**Preoperative examination:** It was done including full ophthalmological examination, visual acuity and endothelial cell count.

**Postoperative Examination:** It was done including full ophthalmological examination and visual acuity on one day, one week and one month while endothelial cell count was done only after one month.

**Ethical consent:** The patients or their family members provided written consent after being fully informed. After receiving approval from the National Institute of Laser Enhanced Sciences' Ethical Committee, the study was conducted. Declaration of Helsinki, which serves as its code of ethics for studies involving humans, governs this activity.

#### Statistical analysis

Results measures were coded, applied, and analysed using Microsoft Excel software. Data were obtained during ophthalmological examination and investigations. Data were next loaded into SPSS version 20.0, the Statistical Package for the Social Sciences. P values were set at 0.05 for outcomes that were significant and 0.001

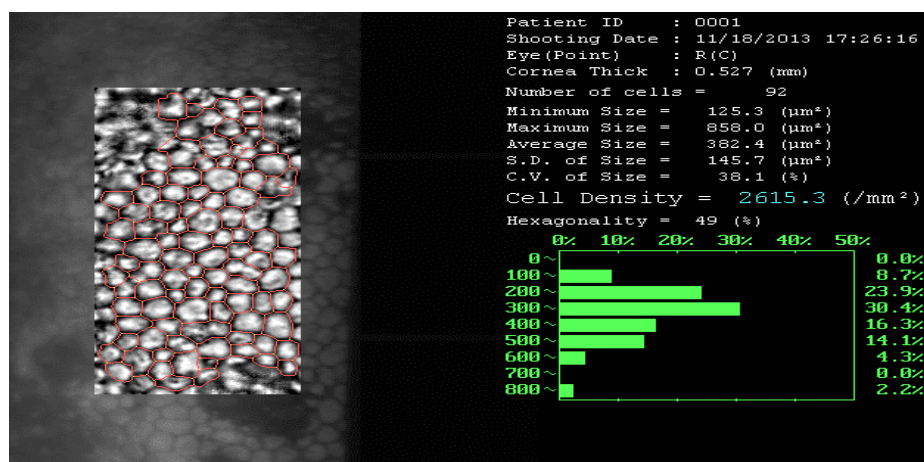
for those that were highly significant. The main, standard deviation and chi square testes were used.



**Figure (1):** Showing fixation of suction ring for ducking.



**Figure no (2):** Victus Femtosecond laser platform screen during FLACS



**Figure (3):** Preoperative endothelial cell count of case (1) FLACS

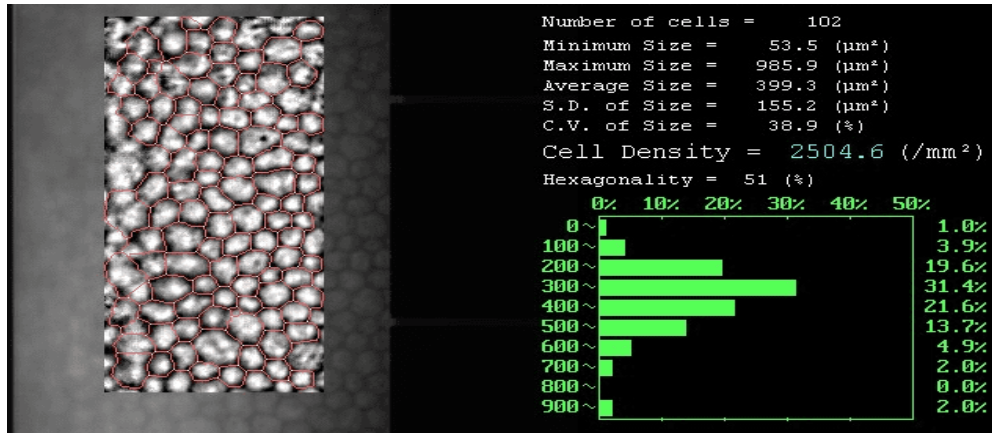


Figure (4): Postoperative endothelial cell count of case (1) FLACS.

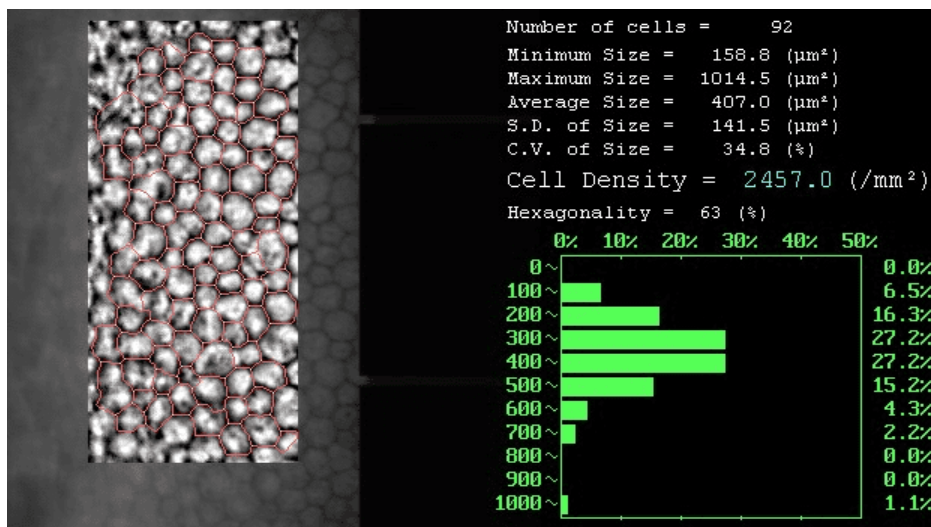


Figure (5): Preoperative endothelial cell count of control group case (3).

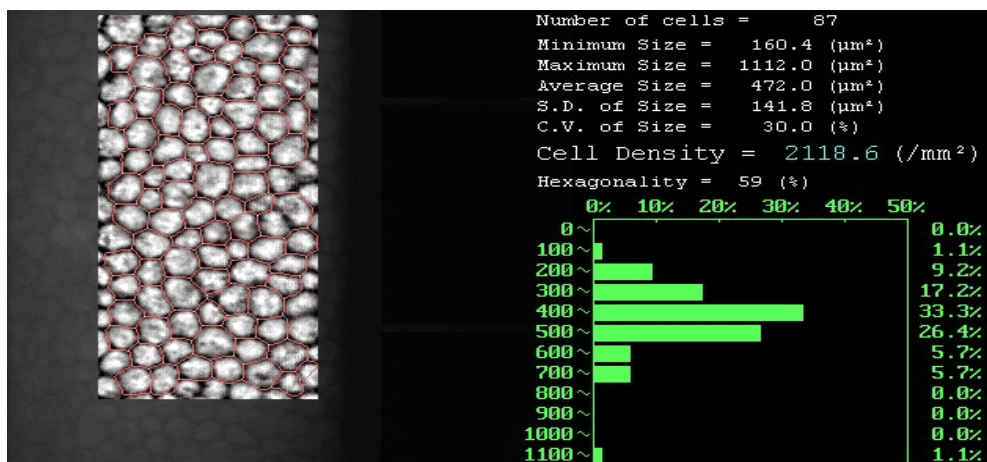
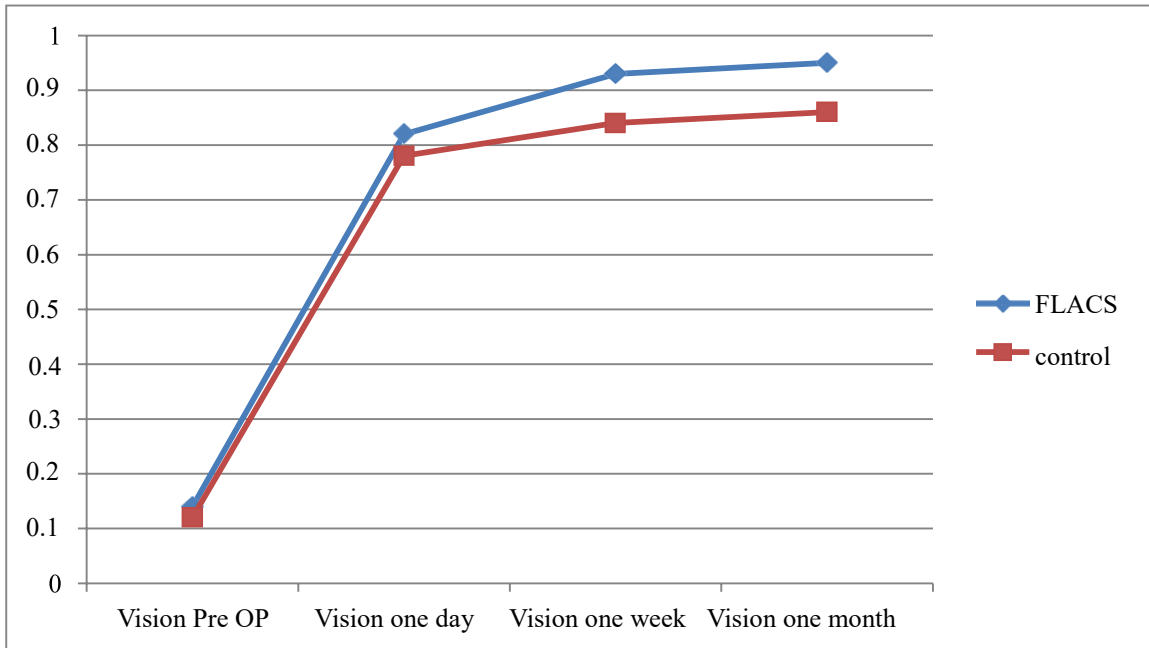


Figure no (6): Postoperative endothelial cell count of control group case (3)

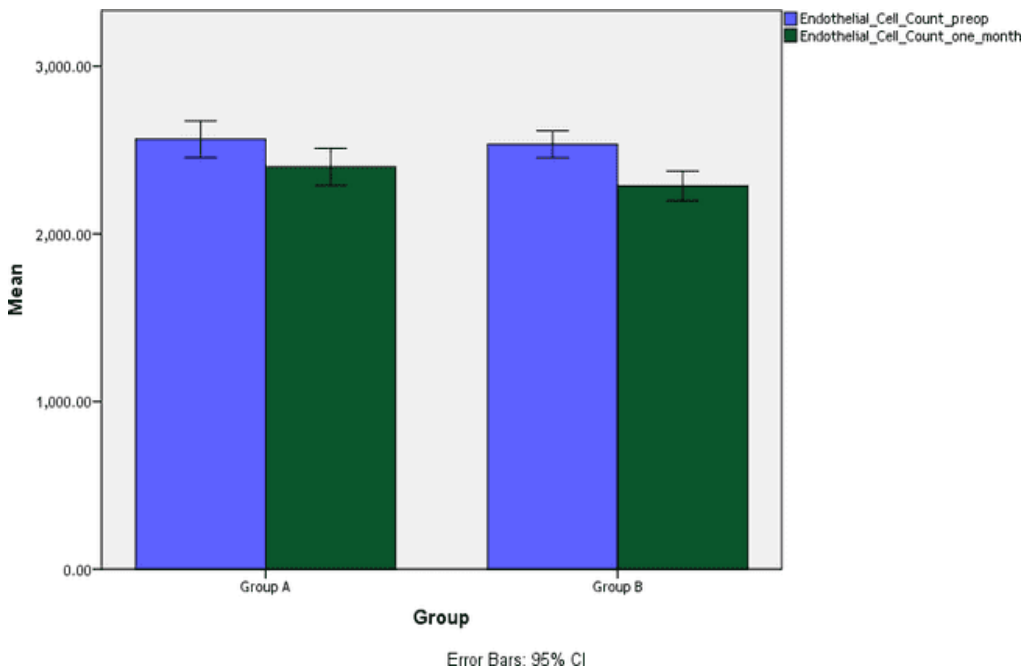
**RESULTS**

Regarding visual acuity, no significant difference between the FLACS and control group at preoperative time or after one day, but after one week and one month, FLACS was clearly superior to the control group, and both groups had significant increases. (Figure 7).



**Figure no (7):** Visual acuity changes with FLACS and control groups.

No discernible difference in endothelial cell count between FLACS and the control group prior of surgery. While, postoperatively both groups significantly decreased but FLACS group was significantly less affected than control group (Figure 8).



**Figure (8):** Endothelial cell count in comparison with control group

## DISCUSSION

Femtosecond Laser-Assisted Cataract Surgery (FLACS) benefits from using the Victus femtosecond laser technology, according to this study<sup>[10]</sup>. Additionally, the laser platform's precision and accuracy have a positive effect on the safety and accuracy of cataract surgery. The Victus platform additionally provides swept source OCT Technology enabling real-time, continuous viewing of the complete procedure for all procedures<sup>[8]</sup>. Overall, the Victus femtosecond laser platform has been shown to improve the precision, safety, and accuracy of cataract surgery, making it a valuable tool for ophthalmologists performing FLACS<sup>[9, 13]</sup>.

In our study using this platform, the visual outcome was significantly improved with FLACS more than in control group while endothelial cell count loss was less with it that indicate efficacy of the procedure and safety on ocular tissue.

To assess the security and effectiveness of FLACS, numerous clinical investigations have been carried out. In comparison with manual cataract surgery, FLACS improved visual outcomes with less endothelial cell loss, according to a randomised controlled experiment by **Nagy et al.**<sup>[20]</sup>. **Li et al.**<sup>[11]</sup> meta-analysis found that FLACS was superior to manual cataract surgery in terms of visual outcomes, postoperative endothelial cell loss, and phacoemulsification times. A study by **Kránitz et al.**<sup>[12]</sup> found that FLACS using the Victus platform resulted in better uncorrected visual acuity, less corneal endothelial cell loss, and more predictable refractive outcomes compared to traditional surgery.

The Victus femtosecond laser platform has been used in several investigations on femtosecond laser-assisted cataract surgery (FLACS). When the refractive results of FLACS and regular phacoemulsification were compared, one study discovered that the FLACS group had a mean postoperative medically-induced astigmatism that was greater<sup>[17]</sup>. Another study used the Victus femtosecond laser platform to examine the clinical outcomes of cystotome-assisted and laser-assisted capsulotomy. It found no significant changes in visual acuity, endothelial cell loss, or complications between the two groups<sup>[18]</sup>. A randomized controlled trial found that FLACS was more effective than phacoemulsification in managing dense cataracts, with better visual outcomes and less phaco energy used<sup>[19]</sup>.

On the other side, a literature review found that FLACS was not significantly more efficacious or safe than manual cataract surgery, but did note that FLACS may be more beneficial in certain cases, such as those with dense cataracts or small pupils<sup>[20]</sup>. However, it is important to note that more studies are needed to determine its long-term safety and efficacy. Additionally,

the cost of FLACS using the Victus platform is higher compared to traditional surgery, which may limit its accessibility to some patients<sup>[21]</sup>.

## CONCLUSION

The Victus femtosecond laser platform allows for successful femtosecond laser aided cataract surgery, and the equipment's features make cataract extraction simple, safe, and with little impact on the ocular tissue as the endothelial cell loss was less with it than with conventional cataract surgery, but long term follow up is recommended.

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