Safety, Efficacy And Complication Rates Utilizing A Second-generation Femtosecond Laser For FLACS Compared To Manual Phaco

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Introduction

- The use of femtosecond laser to perform cataract surgery offers:
  - precise and reproducible corneal microincisions.
  - perfectly circular and well-centered anterior capsulotomies.
  - decreased phacoemulsification ultrasound power.
  - improved centration of the intraocular lens (IOL) etc.
- IOLs well centered on the capsulotomy and making a 360° overlap of the IOL optic are known to reduce the incidence of posterior capsular opacification (PCO).
- Since the femtosecond laser-assisted capsulotomies are perfectly circular and well-centered, the IOL is more likely to achieve a 360° capsulotomy overlap, thereby reducing the risk of PCO.
- The present study compared FLACS performed with a second-generation ALLY femtosecond laser and conventional phacoemulsification for the PCO rate and the quality of the capsulotomy.

Purpose

- To compare the PCO rate and the quality of the capsulotomy achieved during conventional phacoemulsification compared to FLACS with a second-generation femtosecond laser.

Methods

Study Design

- Retrospective study.

Study Procedure

- Eligible patients underwent conventional cataract procedure (N = 42) or FLACS (N = 63) with second-generation dual pulse ALLY femtosecond laser (LENSAR, Inc.).

Outcome Measures

- PCO rates; rate of successful capsulotomy creation; assessment of the capsulotomy size and shape and quality of vision at 6-week follow-up.

Results

IOLs

Similar square edge PCO prevention in both groups

FLACS Group

69.8% enVista (B&L)

15.9% PanOptix (Alcon)

12.7% LAL (RxSight) – square posterior edge only

1.6% Tecnis (JNJ)

Manual Group:

97.6%. enVista (B&L)

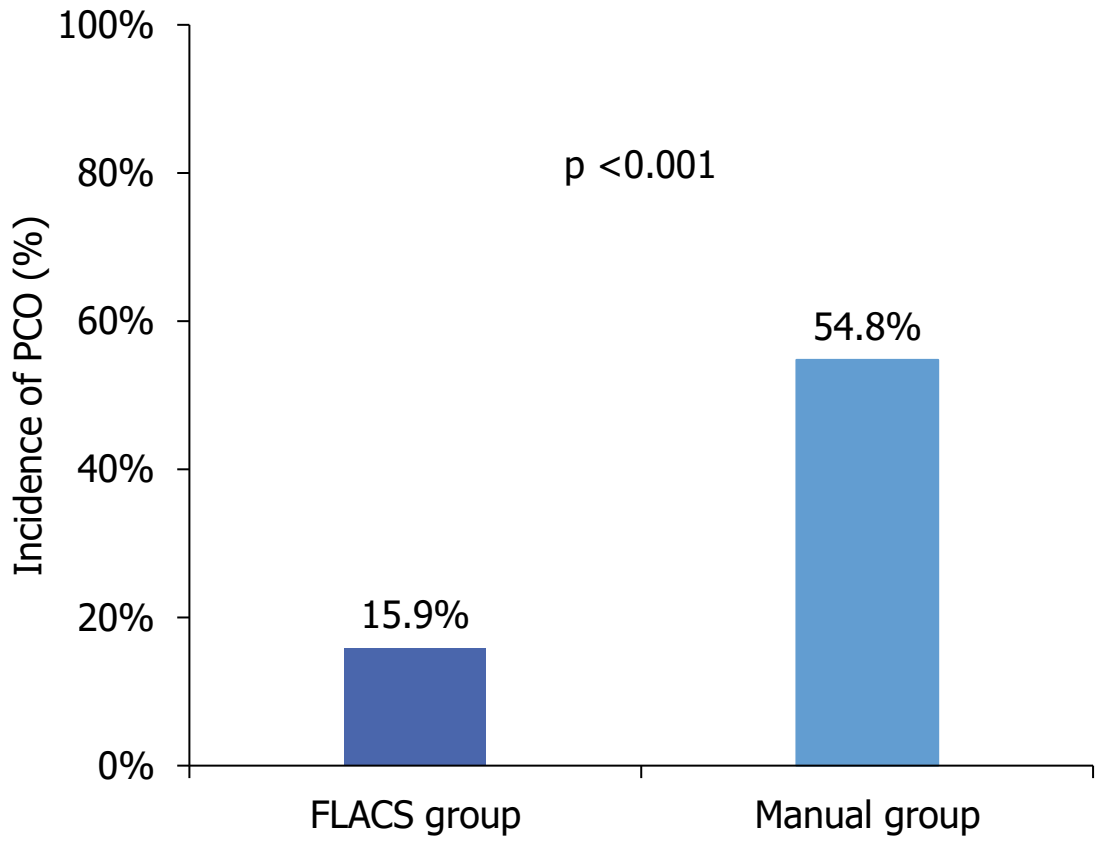
2.4% PanOptix (Alcon)

Surgical technique

Same capsule polishing procedure in both groups

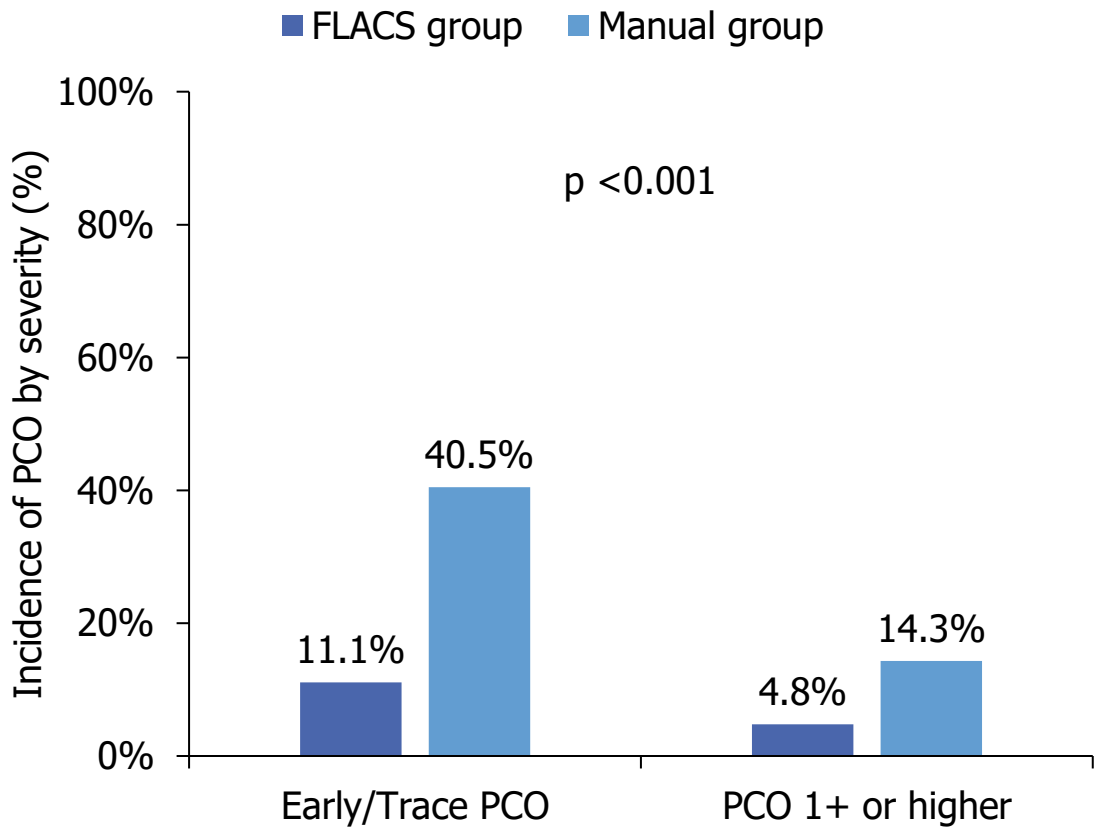
Results

- The incidence of PCO was statistically significantly lower in the FLACS group compared to the conventional phacoemulsification group.



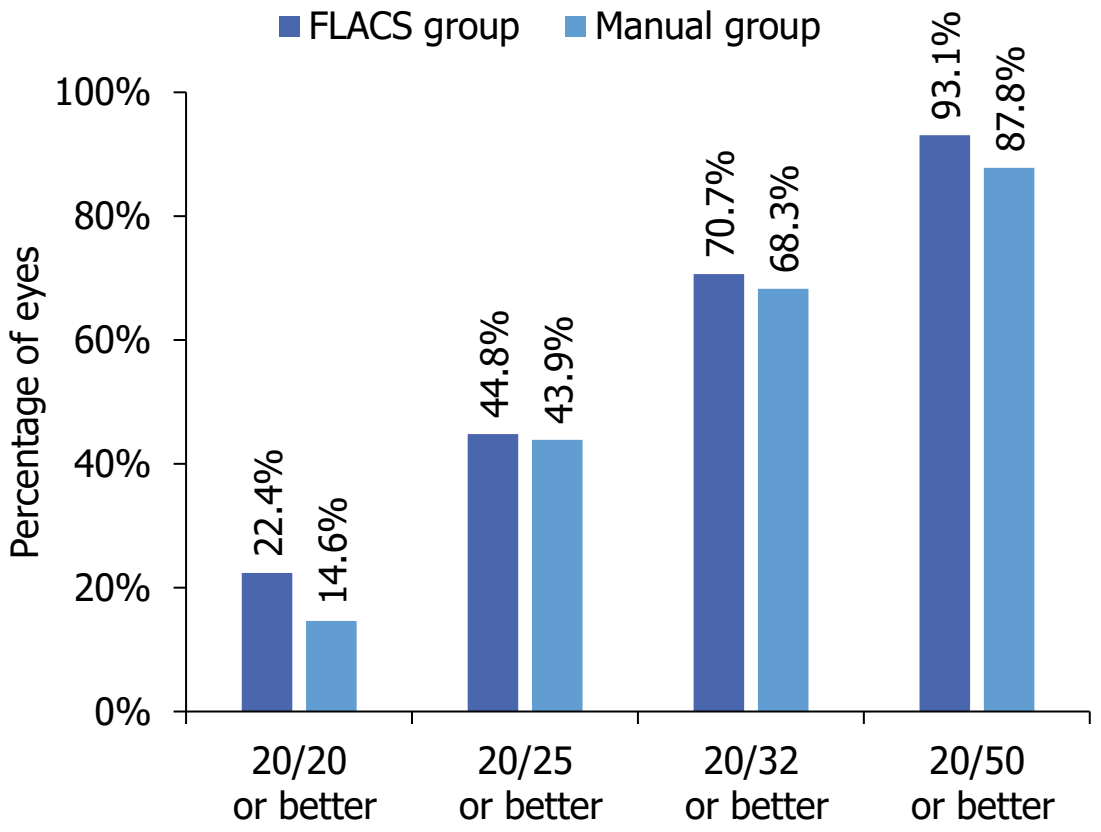
Results

- Even when stratified by severity (trace PCO versus grade 1 or higher), the FLACS group showed statistically significantly lower severity of PCO than the manual phacoemulsification group.



Results: UDVA

- Both the FLACS and the conventional phacoemulsification group showed similar visual acuity outcomes, although the FLACS group trended to yield slightly better outcomes.



Discussion

- PCO is understood to develop from the proliferation, migration, and abnormal differentiation of lens epithelial cells in the capsular bag.
- In the present study, FLACS with the second-generation dual-pulse ALLY femtosecond laser resulted in a significantly lower incidence of PCO than conventional phacoemulsification (15.9% vs 54.8%).
  - Lower PCO rates in the FLACS group could be attributed to a perfectly circular capsulotomy of the intended size that is likely to completely envelop the IOL optic.
    - This prevents the migration of the lens epithelial cells from the equatorial region to the center of the posterior lens capsule.
  - Femtosecond laser-induced cell apoptosis of lens epithelium cells near the capsulotomy edge has also been implicated in reducing the PCO rates.[1,2,3]

1. Toto et al., *J Refract Surg* 2015; 2. Pisciotta et al., *Biomed Res Int* 2018; 3. Sun et al., *Int J Ophthalmol* 2018.

Discussion

- The present study's results align with the published literature, documenting lower odds of developing PCO following FLACS compared to conventional phacoemulsification.
- The odds ratio for the incidence of PCO in the FLACS and the conventional phacoemulsification group was 0.16, favoring FLACS.

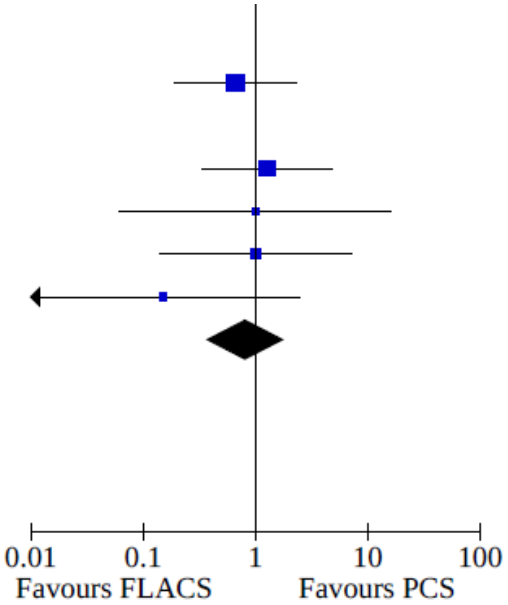
1.9.4 Posterior capsule opacification

Day 2020	4	391	6	389	37.6%	0.66 [0.19 , 2.31]
Kovacs 2014	0	40	0	39		Not estimable
Liu 2021 (1)	5	78	4	78	32.5%	1.26 [0.33 , 4.84]
Oka 2021 (1)	1	55	1	55	7.5%	1.00 [0.06 , 16.19]
Roberts 2019	2	116	2	118	15.0%	1.02 [0.14 , 7.32]
Yu 2015	0	25	2	29	7.4%	0.15 [0.01 , 2.48]
Subtotal (95% CI)		**705**		**708**	**100.0%**	**0.81 [0.38 , 1.73]**
Total events:	12		15			

Heterogeneity: $Chi^2 = 1.98$, df = 4 (P = 0.74); $I^2 = 0\%$

Test for overall effect: Z = 0.55 (P = 0.58)

Test for subgroup differences: $Chi^2 = 0.00$, df = 3 (P < 0.00001), $I^2 = 0\%$



Forest plot showing the rate of PCO between FLACS and conventional phacoemulsification. Taken from the Cochrane database of systematic reviews.[4]

4. Narayan et al., *Cochrane Database of Systematic Reviews* 2023

THANK YOU