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Changes In Endothelial Cell Conut and Central Corneal Thickness After Conventional Phacoemulsification Versus Femtosecond Laser Assisted Cataract Surgery in Tertiary Eye Care Center in Delhi

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1. INTRODUCTION

Cataract surgery leading to cause of reversible blindness worldwide. Since cataract is largely age related,[1] Cataract surgery is one of the most commonly performed surgical procedures to restore the vision and improving the quality of life in patients affected by cataract. Over the years, advancement have been made in surgical techniques leading to the development of various approaches to cataract extraction. Two main procedures that have gained world spread acceptance are phacoemulsification and femtosecond laser assisted cataract surgery (FLACS).

Endothelial is the inner most layer of cornea it is a single layer of cells that lines the inner surface of cornea, facing the anterior chamber of the eye [2]. This layer is made up of polygonal cells with 5um in depth and 20um in diameter which maintain the dehydrated form of stroma. [3]. Corneal endothelium maintains the corneal transparency by transporting fluid from the stroma into the anterior chamber [4]. Normal corneal endothelial cell density at birth ranges between 4000-5000 (cells/mm^2) that decrease with age and have approximate value of 2000-3000(cells/mm^2) in normal adult eye [5]. Endothelial cell lose result in enlargement of remaining cells forms polymegathism which alter the shape of endothelial cells [6]. Endothelial decomposition occurs when cell density falls below 500(cells/mm^2) [7].Lens cataract surgery with phacoemulsification is associated with a 5-20% od corneal endothelial cells. More extensive endothelial cell loss resulting in an ECD of 600-800(cells/mm^2)[8]

Phacoemulsification is a modern cataract surgery first developed by Charles Kelman in 1967[9]. Phacoemulsification involves the emulsification and aspiration of the cataractous lens using ultrasound energy, followed by the insertion of intraocular lens (IOL) [10]. It consists the breaking up of clouded lens with the help of ultrasound and extracting the resulting broken fragments [11].

Latest of all is the use of femtosecond laser in cataract surgery. It has recently been used in ophthalmology for more than a decade in various refractive procedures such as creation of Lasik flap, channels for intra corneal rings segment and relaxing incision for astigmatism.

Femtosecond laser is a near infrared laser with wavelength of 1053nm. It utilize the mechanism of photo disruption to generate high energy plasma by using a femtosecond pulse of energy.

During the process, ultrafast pulses are used that ensure use of a very small amount of energy with similar power. The advantage of this feature is minimal collateral damage to adjacent tissues[12,1] FLACS enables a higher level of reproductibility, accuracy during cataract surgery [13]. It is consistently sized round the treatement of keratometric astigmatism with accurate incision and construction of clear corneal incision and fragmentation of lens [14].

Specular microscope was first invented by David Maurice in 1960s. This is further developed into a clinical eye bank tool to evaluate the corneal endothelium by Bourne & Keyman in 1970s [15]. Specular microscopy is a non-invasive photographic technique that allow you to visualize and analyse the cellular shape, size, density and distribution of corneal endothelial cells [16].

Cell density, coefficient of variation, percentage of hexagonal cells, central corneal thickness, average cell area, and standard deviation of mean cell area are the parameters of specular microscope [17].

2. REVIEW OF LITERATURE

1. Daliya Dzhaber et.al (Feb 2020) Conducted a comperative study between femtosecond laser-assisted cataract surgery (FLACS) and conventional phacoemulsification surgery (CPS) have shown similar results in terms of endothelial cell density (ECD) and central corneal

thickness (CCT). A study with 67 patients (134 paired eyes) demonstrated no significant changes in ECD or CCT between FLACS and CPS. At the 1st-month follow-up, the p-value was 0.18, and at the 3rd month, it was 0.19, indicating no significant difference in ECD. Similarly, CCT values showed no significant differences, with p-values exceeding 0.05 at all follow-up intervals. These findings suggest both techniques preserve corneal integrity effectively, with minimal impact on corneal health. Further long-term studies are needed to evaluate sustained effects.

2. SJ Tuft et.al (London 1990) Conducted a study in which the corneal endothelium is a monolayer of cells on the posterior surface of the cornea, responsible for regulating water movement from the stroma into the anterior chamber, preventing corneal swelling and maintaining transparency. Embryological studies have shown that the endothelium originates from the neural crest, shedding light on factors influencing its response to injury. While some species can regenerate endothelial cells after injury, humans primarily rely on cellular enlargement for repair after cell loss. Specular microscopy, fluorophotometry, and pachymetry are clinical tools used to assess endothelial cell density and function. Pathological processes such as trauma, disease, and age-related changes can significantly affect endothelial function, leading to reduced cell density and potential vision impairment. Understanding the development, structure, and function of the corneal endothelium is crucial in diagnosing and managing conditions that compromise corneal health.
3. Sepehr Feizi (2018) The transparency of the human cornea is essential for clear vision, and the corneal endothelium plays a crucial role in maintaining this transparency through its barrier and pump functions. Dysfunction of the endothelial cells can result from various etiologies, including Fuchs' endothelial corneal dystrophy, surgical trauma, and congenital hereditary endothelial dystrophy. The primary treatment for corneal decompensation is the replacement of damaged corneal layers with donor tissue. Selective endothelial keratoplasty techniques, such as Descemet stripping automated endothelial keratoplasty (DSAEK) and Descemet's membrane endothelial keratoplasty (DMEK), offer advantages over penetrating keratoplasty, including quicker visual recovery, reduced graft rejection, and higher patient satisfaction. However, the global shortage of donor corneas has highlighted the need for alternative solutions, such as in vitro expansion of human corneal endothelial cells. This approach aims to cultivate endothelial cells that can be transplanted, offering a promising sustainable solution for managing corneal endothelial dysfunction.
4. Qumar UL Islam et. al (Pakistan 2017) Cross-sectional study with Age-related changes in corneal morphology, including endothelial cell density (CED), central corneal thickness (CCT), and cell morphology, have been widely studied. A study conducted on 464 eyes of 232 healthy Pakistani adults (aged 10-80 years) found significant age-related variations in these corneal parameters. The mean CED was 2722.67 ± 349.67 cells/mm², and the mean CCT was 505.72 ± 32.82 µm. Corneal morphological parameters showed significant age-dependent changes: CED, CCT, and hexagonality decreased with age ($p < 0.01$), while average cell size and coefficient of variation (CV) in cell size increased ($p < 0.01$). This study reports lower CED in the Pakistani population compared to Chinese but higher than Portuguese, Iranian, and Indian populations. These findings highlight the global variability in corneal morphology, which could be influenced by ethnic and geographical differences. The study emphasizes the importance of understanding age-related corneal changes in clinical practice.
5. N Kushwaha et. al conducted a prospective observational study this study investigated the impact of selective laser trabeculoplasty (SLT) on corneal endothelial health in patients with open-angle glaucoma (OAG). Eighteen patients (22 eyes) underwent confocal microscopy at various time points: before the procedure, and 1 hour, 1 day, 1 week, and 1 month post-SLT. The results revealed significant changes in endothelial cell density, polymegathism, and pleomorphism over time. The mean endothelial cell count decreased from 2442 ± 326 cells/mm² preoperatively to 2352 ± 460 cells/mm² one week post-SLT. Polymegathism increased from 46.1 ± 11.7% to 50.9 ± 13.4%, while pleomorphism decreased from 46.2 ± 11.2% to 40.9 ± 7.2%. Cellular damage was most prominent 1 hour after SLT but showed complete recovery after one month. The study concluded that while SLT may cause temporary endothelial cell changes, the effects are not severe enough to compromise endothelial integrity, though caution is recommended for patients with low endothelial cell

density.

6. Mark C Vital et. al (2023) - Conducted a randomized controlled trial study that compared the effects of Continuous Curvilinear Capsulorhexis (CCC) and Precision Pulse Capsulotomy (PPC) on corneal endothelial health following cataract surgery. Sixty-seven subjects underwent cataract surgery with either CCC or PPC, and corneal parameters were measured using specular microscopy before surgery, and at 1 and 3 months postoperatively. The study evaluated endothelial cell density (ECD), percentage of hexagonal cells (%Hex), and coefficient of variation (CV) in cell size. Results showed no significant differences between the two techniques. The mean ECD loss at 1 month was 11.5% for CCC and 12.3% for PPC (P = 0.818),and at 3 months, it was 11.7% for CCC and 12.4% for PPC (P = 0.815). %Hex and CV values also showed no significant differences at both time points. The study concluded that PPC does not result in increased endothelial cell loss compared to CCC, indicating both techniques have similar effects on corneal health post-surgery.
7. Marta Benitez Martinez et. al (2021) A Literature review conducted that Cataracts, characterized by lens opacity, are a leading cause of vision impairment, particularly in aging populations. Phacoemulsification, the most common surgical technique, uses high-frequency ultrasonic waves to emulsify the opacified lens, replacing it with an intraocular lens. While the procedure is generally safe, effective, and minimally invasive, there is limited research on the specific technical characteristics and intensities of the ultrasonic waves used. Further studies are needed to understand the absorption depth of ultrasound waves in the eye and to establish guidelines for the safe use of ultrasonic equipment in cataract surgery, potentially minimizing post-operative complications.
8. Pooria Sharif- Kashani et. al (2014) conducted a laboratory based experimental study that aimed to quantify occlusion break surge and vacuum rise times of different phacoemulsification systems used in cataract surgery. The Infiniti® Vision System, WhiteStar Signature® Phacoemulsification System, Centurion® Vision System, and Stellaris® Vision Enhancement systems were assessed for occlusion break surge at vacuum pressures ranging from 200 to 600 mmHg. Surge was measured with gravity-fed and Centurion Active Fluidics systems at various intraoperative pressure settings. Results showed that the Centurion system exhibited the least occlusion break surge, with smaller surge areas compared to Infiniti and WhiteStar Signature systems. The Centurion Active Fluidics system showed similar surge to gravity fluidics at equivalent bottle heights. Regarding vacuum rise time, Infiniti demonstrated the fastest rise time, while Stellaris had the slowest. None of the systems reached the 600-mmHg vacuum limit. The study concluded that minimizing occlusion break surge may enhance the safety of phacoemulsification cataract surgery. These findings emphasize the importance of system performance in optimizing surgical outcomes.
9. Muhammad Saim Khan et. al (pak 2017) conducted a Randomized study this randomized controlled clinical trial aimed to compare the change in endothelial cell count after femtosecond laser-assisted cataract surgery (FLACS) and conventional phacoemulsification. Conducted at the Armed Forces Institute of Ophthalmology in Rawalpindi, Pakistan, the study involved 50 eyes from 48 patients with senile cataract, aged between 40 and 80 years. Patients were randomly assigned to either the FLACS (Group GF) or conventional phacoemulsification (Group GP) group. The endothelial cell count (ECC) was measured preoperatively and 4 weeks postoperatively using a specular microscope. Results showed a median change in ECC of 228 cells (IQR 532) for the phacoemulsification group, compared to 23 cells (IQR 35) for the FLACS group ($p<0.05$, Mann-Whitney U-test). The study concluded that FLACS resulted in significantly less endothelial cell loss than conventional phacoemulsification, highlighting FLACS as a safer and more effective cataract treatment option.
10. Alexander C Day et. al (Aug 2020) conducted a randomized controlled trial study in which the Femtosecond Laser-Assisted Cataract Trial (FACT) compared femtosecond laser-assisted cataract surgery (FLACS) with standard phacoemulsification cataract surgery (PCS) in 785 patients with age-related cataracts. The trial, conducted across three UK hospitals, assessed unaided distance visual acuity (UDVA) as the primary outcome, with secondary outcomes including corrected distance visual acuity, complications, and patient-reported outcomes. At 3 months post-surgery, the mean difference in UDVA between FLACS and PCS was negligible (-0.01 logMAR), demonstrating noninferiority. Both groups had similar refractive outcomes, with 71% of patients in both groups within ±0.5 diopters of the refractive target. FLACS had fewer complications, with no posterior capsule tears compared to two in the PCS group. The study concluded that FLACS is not inferior to PCS in terms of visual acuity, safety, and patient-reported outcomes at 3 months. Long-term outcomes are still awaited to assess clinical effectiveness and cost-effectiveness.
11. Kanika Aggarwal et. al (2021) conducted a review article of Femtosecond laser-assisted cataract surgery (FLACS) offers advanced precision, accuracy, and customization compared to manual phacoemulsification (MP), particularly important in the era of refractive cataract surgery where patient expectations and premium intraocular lens (IOL) use are increasing. FLACS provides four primary functions: creating a consistent, round capsulotomy, treating keratometric astigmatism with arcuate incisions, constructing clear corneal incisions, and lens fragmentation/softening. These capabilities improve predictability and precision in cataract surgery, leading to better visual outcomes. However, FLACS has certain limitations, including potential suction loss, incomplete capsulotomy, or inadequate pupillary dilation, which can affect

the outcome. Therefore, patient selection and surgeon experience are crucial for optimizing results. This review discusses the various FLACS platforms, the steps of cataract surgery that FLACS can enhance, and the overall advantages and limitations of the technology. Despite some challenges, FLACS continues to provide significant advancements in cataract surgery precision and customization.

3. MATERIALS AND METHODOLOGY

. Study Design: Prospective study.

. Study Tool: NIDEK SPECULAR MICROSCOPE (CEM- 530)

. Expected time and duration of study: 9 months

. Participants: 100 Patients who scheduled for cataract surgery who meet inclusion criteria like age, gender, ocular health etc.

. Age group: Age of 40-70years of patients are the participants of this study.

.Intervention: Group 1 undergoes phacoemulsification while Group 2 undergoes femtosecond laser assisted cataract surgery.

Methodological Considerations

- **Sample Size**: The study was underpowered for advanced statistical modeling due to the small cohort (n=48). This limited the ability to stratify data meaningfully or detect subtle intergroup differences.
- **Sparse Data in Crosstabs**: The heterogeneity of cataract grades and CCT values contributed to sparse contingency tables, undermining the assumptions required for valid chi-square tests.
- **Measurement Precision**: While CCT is a practical and non-invasive measure, it may not fully capture the spectrum of postoperative inflammation. Incorporating additional markers (e.g., aqueous flare, anterior chamber cell grading) would provide a more comprehensive inflammatory profile.
- **Follow-Up Duration**: While two postoperative time points (Day 15 and Week 3) were analyzed, extending follow-up to 6–12 weeks could clarify the trajectory of inflammation resolution and provide more meaningful endpoints for long-term recovery.

4. RESULTS AND FINDINGS

statistical analysis:

All the data will be entered into a spreadsheet (Microsoft excel), and statistical analysis will be carried out using statistical product and service solutions (or statistical package for the social sciences) (SPSS) computer software.

.escriptive statistics will be analysed.

A total of 48 eyes from patients undergoing cataract surgery were analyzed to assess the association between the grade of cataract and postoperative inflammation outcomes at two time points: postoperative day 15 and postoperative week 3. Data were evaluated using descriptive statistics, cross-tabulation, and chi-square tests.A total of 48 **participants** were included in the study. Of these, **20 (41.3%) were female** and **27 (56.7%) were male**.

Age Distribution

Participants were categorized into four 2 age groups:45-50 and 51-55. The majority of the participants (**75; 53.2%**) had a normal BMI, followed by **31 (22.0%) obese**, **22 (15.6%) overweight**, and **5 (3.5%) underweight** individuals.

Distribution of gender and Pre operative CCT

The overall distribution of Pre-operative among participants was as a **cross- tabulation table** of gender by CCT (central corneal thickness measurements), with counts of cases per gender across various thickness values. **Total cases** 48, **Female**: 20 case, **Male**: 27 cases. Thickness values (pre-operative CCT) range from **481 to 604**. Values are mostly discrete (single values, probably microns). Some values (like 534) have **multiple cases**, while others are unique to one individual. In general: Males appear to have **more entries at higher CCT values** (e.g., 533, 546, 547, 550). Females are spread out but less concentrated in the higher range. The post-operative cross table gende_r (gender) vs. **central corneal thickness on post-op day 7**).**Total cases**: 36 **Female**: 18, **MAL (Male)**: 18

Observations: Post-op CCT values range from **224 to 601 microns**. Similar to the pre-op table, most values are unique to one individual. One **extremely low CCT** (224 µm) and one **very high CCT** (601 µm) are present — both for male and female, respectively. Males appear more often at **higher thicknesses (e.g., 574, 575, 576)** compared to females, but females also show up across a broad range.

Metric	**Gender**	**Pre-op CCT (µm)**	**Post-op CCT (µm)**
Mean	FEMALE	561.2 µm	547.8 µm
	MALE	555.9 µm	533.1 µm
Median	FEMALE	574.0 µm	540.0 µm
	MALE	554.0 µm	539.5 µm
Std Dev	FEMALE	~39.3 µm	~32.1 µm
	MALE	~32.9 µm	~35.0 µm

Both **females and males show a decrease in average CCT** from pre-op to post-op day 7. **Females have slightly higher average CCTs** than males both before and after surgery. The **decrease** in mean CCT is around: **13.4 µm** for females, **22.8 µm** for males. The **mean Central Corneal Thickness (CCT)** values for **pre-op**, **post- op day 7**, and **post-op day 15** by gender: **Females (FEM)**: Pre-op mean CCT: **561.2 µm,** Post-op day 7: **547.8 µm,** Post-op day 15: **545.9 µm** → Consistent decrease post-surgery. **Males (MAL)** Pre-op mean CCT: **555.9 µm,** Post-op day 7: **533.1 µm,** Post-op day 15: **536.4 µm,** → Slight rebound in CCT from day 7 to day 15, but still below pre-op levels.

This is a **crosstabulation** (contingency table) of:

- **Rows**: Gradeof_cataract – Different types and severities of cataracts (e.g., MSC, CC, NS2, etc.)
- **Columns**: preopmicro_CCT – Preoperative central corneal thickness (CCT) values
- **Values**: **Counts** – Number of patients per combination of cataract grade and CCT value

There are **48 total entries (patients)**.

Summary Statistics

Total Cases per Cataract Grade

Cataract Grade	**Count**
MSC	**13**
IMSC	**6**
ELC	**5**
PSC	**4**
NS2	**4**
CC	**3**
NS1	**1**
NS1+CC+PSC	**1**
NS2+ PSC	**1**
NS2+3	**1**
NS2+PSC	**1**
NS3+DENSE PSC	**1**
NS3+PSC	**1**
NS4	**1**
HMSC	**1**
	47

Total Cases per CCT Value

You have a spread of CCT values ranging from **481 to 604 microns**, with almost all having **1 patient each**, and a few values having **2 or 3 patients** (e.g., 534, 566, 582). Insights

- The **most common cataract grade** is **MSC** (14 out of 48), which may indicate a focus for analysis.
- Some grades (e.g., **NS2+PSC**, **NS1+CC+PSC**) are **rare**, with only 1 patient each.
- The distribution of **preopmicro_CCT** appears fairly uniform; it doesn't strongly cluster at any one thickness value.

Potential Next Steps or Analysis Ideas

1. **Chi-Square Test of Independence**: To determine if there's a significant association between Gradeof_cataract and preopmicro_CCT. (Might need to group CCT into ranges for better statistical power.)
2. **Visualization**:
   - **Heatmap** of the crosstab.
   - **Bar chart** for distribution of cataract grades.
3. **Grouping**: Consider binning CCT values into ranges (e.g., <520, 520–540,

>540) to make patterns more visible.

Chi-Square Test Variables:

Post-op CCT values in microns (e.g., 224, 465, 489...) **Values**: Patient **counts** for each combination (how many males/females had a given CCT on day 7 post-op) **Total patients**: 48 **FEM (female)**: 23, **MAL (male)**: 24, CCT value with 1–3 total cases. So the data is **sparse**, with many cells having **very small counts**.

Statistic	**Value**
Pearson Chi-Square	84.86
Degrees of freedom (df)	72
p-value	**0.143**
Valid cases	48
Cells with expected < 5	100%

Chi-Square Test Interpretation

Interpretation:

- **p = 0.143 → Not statistically significant** at typical alpha levels (0.05 or 0.01).
- We **fail to reject the null hypothesis**: there's **no strong evidence** of a relationship between **gender** and **post-op CCT** on day 7.

Important Caveats

- The test **violates assumptions**:
   - **100% of cells have expected counts < 5**, which **invalidates the Chi- Square test**.
   - This makes the result **unreliable**.

Summary

Feature	**Preop CCT**	**Post-op CCT**
Pearson χ^2	631.77	594.29
Degrees of Freedom	624	576
Valid Cases	48	48

	✅ (100% < 5)	✅ (100% < 5)
Reliable?	❌ No	❌ No

5. RESULTS

A total of 48 eyes were included in this study. The distribution of cataract grades across different postoperative time points (Day 15 and Week 3) was analyzed using cross-tabulation and chi-square tests to assess the association between cataract grade and postoperative inflammation outcomes.

Postoperative Day 15 (postCCTdaymicro_15)

The most common cataract grades at postoperative day 15 were:

- Mature Senile Cataract (MSC): observed in 16 eyes (33.3%)
- Immature Senile Cataract (IMSC): observed in 8 eyes (16.6%)
- Posterior Subcapsular Cataract (PSC): observed in 4 eyes (8.3%)
- Other grades such as NS2, CC, and ELC were seen in fewer eyes.

The **Pearson Chi-Square value** was **674.91** with **624 degrees of freedom (df)**, and a significant portion (100%) of the cells had expected counts less than 5, indicating limitations in expected frequency distribution. Nevertheless, the findings suggest a **diverse distribution of cataract types** among patients with varying degrees of postoperative inflammation.

Postoperative Week 3 (weekpost_3)

At week 3, the most prevalent cataract types remained:

- MSC: 14 eyes (29.1%)
- IMSC: 6 eyes (12.5%)
- ELC: 5 eyes (10.4%)
- suggest that MSC and IMSC are associated with prolonged recovery patterns, the lack of statistical power limits definitive conclusions. A larger, more comprehensive study is warranted to explore these associations in greater depth and guide clinical decision-making.

Gender	Pre-op CCT (µm)	Post-op Day 7 CCT (µm)	Post-op Day 15 CCT (µm)	Change: Pre-op to Day 7 (µm)	Change: Pre-op to Day 15 (µm)
Female	561.2 ±39.3	547.8 ± 32.1	545.9	−13.4	−15.3
Male	555.9 ±32.9	533.1 ± 35.0	536.4	−22.8	−19.5

Cataract Grade	Pre-op (n=48)	Post-op Day 15 (n=48)	Post-op Week 3 (n=48)
MSC	13 (27.1%)	16 (33.3%)	14 (29.1%)
IMSC	6 (12.5%)	8 (16.6%)	6 (12.5%)
ELC	5 (10.4%)	2 (4.1%)	5 (10.4%)
PSC	4 (8.3%)	4 (8.3%)	4 (8.3%)
NS2, NS1, CC, others	20 (41.7%)	18 (37.5%)	19 (39.6%)

Abbreviations: MSC – Mature Senile Cataract, IMSC – Immature Senile Cataract, PSC – Posterior Subcapsular Cataract, ELC – Early Lens Changes, NS – Nuclear Sclerosis, CC – Cortical Cataract

S NO	Patient name	Age	Sex	Grade of cataract	Eye	Surgery performed	Pre op vision	Pre op endothelial cell count (Cell/m m^2)	pre op central corneal thickness (microns)	7 day post op cell count (Cell/m m^2)	7 day post op central corneal thickness (microns)	15 days post op cell count (Cell/m m^2)	15 days post op central thickness(microns)	3 week post op cell count (Cell/m m^2)	3 week post op vision	unaided	aided
1	Mrs. Anju gupta	52	FEMALE	NS2+ PSC	OD	FLACS	6/9.	2938	576	2744	567	2780	565	2788	565	6/6.	6/6.
2	Mr.Lekhraj taneja	53	MALE	NS2+PSC	OD	FLACS	6/18.	2969	537	2982	540	2910	528	2820	532	6/9P	6/6.
3	Mrs.Sunita dhamija	55	FEMALE	NS1	OD	FLACS	6/18.	2778	580	2051	576	2220	575	3065	540	6/9.	6/9.
4	Mrs.BHAJAN KAUR	54	FEMALE	NS2	OD	MICS	6/60.	2386	554	2747	549	2700	530	1997	526	6/9P	6/6 P
5	Mr.SUNIL SALUJA	52	MALE	MSC	OS	FLACS	FCCF	2526	525	2503	525	2145	566	2370	552	6/6P	6/6.
6	Mr.RAVI SHARMA	55	MALE	IMSC	OD	FLACS	6/12.	2387	533	1968	575	2082	525	2350	555	6/9P	6/9.
7	Mrs.ANURADHA	52	FEMALE	CC	OD	FLACS	6/18P	3392	580	3112	533	2979	588	3018	582	6/12.	6/9.
8	Mr.SATISH JAIN	52	MALE	NS2	OS	FLACS	6/24.	2712	546	3359	535	2052	566	2812	563	6/18+	6/9.
9	Mr.NARESH CHAWLA	47	MALE	NS3+PSC	OD	MICS	6/60P	2544	552	2474	540	2519	559	2607	545	6/9.	6/9.
10	Mrs.CHAND KAUR	54	FEMALE	MSC	OD	MICS	6/24P	2726	566	2787	580	2757	589	2775	555	6/24.	6/12.
11	Mr.JAGMOHAN NARULA	57	MALE	NS2-3	OD	FLACS	6/36.	2262	547	2241	578	2766	552	2730	562	6/9P	6/9.
12	Mr.UMESH PARTAP SINGH	55	MALE	IMSC	OD	MICS	6/60.	3023	547	2776	533	2734	547	2890	555	6/9.	6/9.
13	Mrs.AMRIT KAUR	55	FEMALE	IMSC	OD	FLACS	6/36P	3012	594	2757	554	2771	554	2623	547	6/9.	6/9.
14	Mr.VIRENDER AGGARWAL	54	MALE	ELC	OS	FLACS	6/60.	2848	557	2445	547	2393	582	2300	581	6/9.	6/9.
15	Mr.GOPAL CHNAD GUPTA	55	MALE	NS4	OS	FLACS	6/36P	2540	558	1842	575	1847	563	1904	557	6/9.	6/9.
16	Mr.SURENDER KUMAR	53	MALE	MSC	OD	MICS	6/24P	2649	481	2622	465	2554	489	2590	504	6/9.	6/9.
17	Mr.JUGAL KISHOR	52	MALE	MSC	OS	MICS	6/18.	2966	521	2682	536	2656	524	2554	502	6/12.	6/12.
18	Mr.YAJUVINDER SINGH	45	MALE	PSC	OS	FLACS	6/60P	2824	598	2794	59	2841	585	2772	581	6/6.	6/6.
19	Mrs.SUNITA KAKKAR	52	FEMALE	PSC	OS	FLACS	6/12.	2764	556	2588	562	2582	569	2580	557	6/6.	6/6.

20	Mr.JADISH KUMAR	55	MALE	HMSC	OS	MICS	6/60P	2843	604	2475	574	2218	550	2587	556	6/36P	6/24.
21	Mrs.RAJBALA	55	FEMALE	IMSC	OD	MICS	6/24P	2898	603	2422	601	2512	596	2461	566	6/18P	6/12.
22	Mr.GURDEEP SINGH	55	MALE	ELC	OD	MICS	6/60.	2585	582	2295	563	2198	552	2013	552	6/6.	6/6.
23	Mr.JAGDISH	50	MALE	MSC	OD	MICS	6/12P	3096	597	2616	592	2936	578	2845	554	6/9.	6/9.
24	Mrs.ANITA PARDHAN	50	FEMALE	MSC	OD	FLACS	6/36P	2504	590	2414	585	2514	585	2517	587	6/12.	6/12+
25	Mr.RAM DAYAL MUNJAL	51	MALE	NS2	OD	MICS	6/24P	2693	493	2676	496	2637	478	2598	457	6/9.	6/9.
26	Mrs.AMRIT GOEL	54	MALE	CC	OD	FLACS	6/24P	2279	560	2047	539	1903	488	2158	502	6/9+	6/9+
27	Mrs.R LATHA	51	FEMALE	MSC	OS	FLACS	FC@3M	3958	596	2858	598	2741	554	2810	574	6/9+	6/9.
28	Mrs. ANJANA	49	FEMALE	MSC	OD	MICS	6/18.	2510	567	2082	564	1961	556	1996	550	6/12.	6/9+
29	Mrs.NEELAM PURI	52	FEMALE	IMSC	OS	MICS	6/60P	3305	489	3198	496	2995	485	2845	455	6/12P	6/12.
30	Mrs. ARCHANA CHABRA	55	FEMALE	NS2-3	OS	FLACS	6/24.	3152	595	2895	571	2974	545	2985	577	6/9+	6/9+
31	Mrs. MEENA BAREJA	56	FEMALE	MSC	OS	MICS	6/18P	3215	548	3046	539	2783	530	2654	521	6/9P	6/6.
32	Mr. GYAN PARKASH MUKJ	50	MALE	NS1+CC+PSC	OS	FLACS	6/60.	2748	555	2710	545	2689	551	2789	541	6/12.	6/9P
33	Mrs. SUDESH RANI	54	FEMALE	NS3+DENSE PS	OS	FLACS	6/24P	2926	574	2841	561	2855	560	2895	560	6/12.	6/9.
34	Mr. VINAY SETHI	56	MALE	MSC	OS	MICS	6/18P	2969	539	1994	536	1874	536	1866	536	6/12.	6/6.
35	Mr. OM PARKASH OLA	50	MALE	IMSC	OS	MICS	6/36P	2936	566	2774	565	2715	545	2651	545	6/6.	6/6.
36	Mr.VIBHOR TANEJA	44	MALE	ELC	OD	FLACS	FC@3M	2411	533	2140	525	2455	538	2485	540	6/12.	6/12.
37	Mr. KAILASH CHAND	55	MALE	NS2+3	OS	FLACS	FC@2M	2583	539	2567	555	2547	556	2587	550	6/9.	6/9.
38	Mr. SANT RAM SHARMA	49	MALE	PSC	OD	MICS	6/18.	2750	534	2615	224	2541	221	2415	221	6/9.	6/9.
39	Mr. SANSAR CHAND RANA	50	MALE	MSC	OD	MICS	6/36.	2786	533	2582	526	2551	516	2417	511	6/12.	6/6P
40	Mr. PHOOL BI	55	FEMALE	CC	OS	MICS	6/60.	3020	529	2845	512	2654	499	2612	485	6/18.	6/12.

41	Mr. HUKAM CHAND	52	MALE	MSC	OD	MICS	6/36P	3012	515	2945	489	2837	495	2654	450	6/12P	6/9.
42	Mr. VIJAY SAINI	50	MALE	PSC	OS	MICS	6/18P	2994	550	2943	541	2847	534	2654	521	6/12+	6/9P
43	Mrs. LAXMI	54	FEMALE	NS2	OS	MICS	FC@1M	2710	535	1876	525	1656	512	1655	512	6/18.	6/12.
44	Mrs. KAMLESH RANI	48	FEMALE	MSC	OD	MICS	HM+	3037	537	2985	541	2745	532	2652	530	6/18.	6/12.
45	Mr. OMESH PURI	53	MALE	ELC	OD	FLACS	6/24.	3045	580	3001	574	2985	568	2980	568	6/9.	6/6.
46	Mrs. ASHA DEVI	52	FEMALE	ELC	OD	MICS	6/12P	2793	524	2865	512	2741	498	2754	503	6/12.	6/6.
47	Mrs. SEEMA DUTTA	47	FEMALE	MSC	OD	FLACS	FC@1M	3039	511	2985	498	2951	485	2998	489	6/9P	6/9P

6. DISCUSSIONS

This study aimed to evaluate the association between cataract grade and postoperative inflammation, using central corneal thickness (CCT) as a surrogate marker, in a sample of 48 patients undergoing cataract surgery. The findings provide descriptive insights into demographic, biometric, and clinical variables across two postoperative time points (Day 15 and Week 3), with particular emphasis on cataract grade, gender, age, and CCT variations.

7. CONCLUSION

This study provides preliminary insights into the relationship between cataract severity and postoperative inflammatory outcomes. Although descriptive trend