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The Analysis Study of Inflammation Management after Cataract Surgery: A Case Report and Comprehensive Systematic Review

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ABSTRACT

Background: The management of postoperative inflammation is a critical aspect of achieving successful outcomes in cataract surgery. Over the last decade, nonsteroidal anti-inflammatory drugs (NSAIDs) have gained widespread popularity in the postoperative setting, often being prescribed in conjunction with corticosteroids. This study aims to present a systematic review and case report of inflammation management in cataract surgery involving 59 year old male with senile cataract and glaucoma. **Methods:** The study adhered to PRISMA 2020 standards, examining English literature from 2014 to 2024. It excluded editorials, reviews from the same journal, and submissions without a DOI. PubMed, SagePub, SpringerLink, and Google Scholar were utilized as literature sources. **Case Management:** A 59-year-old male patient presented to Randegansari Husada Hospital, Gresik Regency with a five-year history of worsening blurry vision, primarily in the right eye, with recent dizziness and no significant pain. Diagnosed with immature senile cataract and secondary glaucoma, he underwent successful phacoemulsification surgery with improved visual acuity postoperatively. **Result:** Initially retrieving 500 articles from online databases (PubMed, SagePub, SpringerLink and Google Scholar) five relevant papers were selected after three rounds of screening for full-text analysis. **Conclusion:** Combining NSAIDs and corticosteroids shows promise in managing postoperative inflammation and reducing intraocular pressure after cataract surgery. Newer delivery systems may further enhance recovery outcomes and improve patient care.

Keyword: senile cataract, cataract surgery, NSAID, corticosteroid

INTRODUCTION

Age-related cataract is the most common cause of treatable blindness globally, accounting for approximately 47.8–51% of all cases of blindness worldwide.¹ Despite advancements in surgical techniques and an increase in the number of cataract surgeries performed, cataract remains a leading cause of visual impairment and blindness, especially in middle and low-income countries. Currently, over 13 million individuals are affected by cataract-induced blindness, with cataracts responsible for 50% of blindness in developing regions, compared to just 5% in developed nations.²

Cataracts involve the clouding of the eye's lens, leading to significant vision loss. The prevalence of cataracts increases sharply with age, ranging from 3.9% in those aged 55-64 to 92.6% in those aged 80 and older.³ The condition progresses as a result of cumulative cellular changes, including protein denaturation, oxidative stress, and disruptions in metabolic processes, which contribute to lens opacification and visual decline.⁴

The management of postoperative inflammation is a critical aspect of achieving successful outcomes in cataract surgery, one of the most common surgical procedures globally. Over the last decade, nonsteroidal anti-inflammatory drugs (NSAIDs) have gained widespread popularity in the postoperative setting, often being prescribed in conjunction with corticosteroids. Despite the overwhelming acceptance of this practice, the clinical evidence supporting the use of NSAIDs for improving long-term visual outcomes remains limited.⁵

A survey conducted by the American Society of Cataract and Refractive Surgery in 2012 revealed that 90% of its members routinely prescribed NSAIDs alongside corticosteroids during cataract surgery, contributing to an annual societal cost of approximately \$540 million. However, there is no substantial evidence indicating that NSAIDs provide a therapeutic benefit that cannot be achieved with corticosteroids alone, raising questions about the redundancy of prescribing both anti-inflammatory agents.^{6,7}

Despite studies suggesting that NSAIDs are more effective in controlling postoperative inflammation, the broader anti-inflammatory properties of corticosteroids have long been established in clinical practice as being more effective for reducing intraocular inflammation.⁸⁻¹⁰ This study aims to present a systematic review and case report of inflammation management in cataract surgery involving 59 year old male with senile cataract and glaucoma.

METHODS

Protocol

The author carefully followed the rules laid out in the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020. This was done to make sure the study met all its standards. The selection of this methodological

approach was specifically aimed at ensuring the precision and reliability of the conclusions drawn from the investigation.

Criteria for Eligibility

This study aims to present a systematic review and case report of inflammation management in cataract surgery based on literatures of the last 10 years. This study meticulously analyzed data on literatures to provide insights and enhance patient treatment strategies. The primary objective of this paper is to highlight the collective significance of the identified key points.

Inclusion criteria for this study entail: 1) Papers must be in English, and 2) Papers must have been published between 2014 and 2024. Exclusion criteria comprise: 1) Editorials; 2) Submissions without a DOI; 3) Previously published review articles; and 4) Duplicate entries in journals.

Search Strategy

The keywords used for this research are senile cataract, cataract surgery, NSAID, corticosteroid. The Boolean MeSH keywords inputted on databases for this research are: (((("senile"[All Fields] OR "seniles"[All Fields] OR "senility"[All Fields]) AND ("cataract"[MeSH Terms] OR "cataract"[All Fields] OR "cataracts"[All Fields] OR "cataractic"[All Fields] OR "cataractous"[All Fields])) OR ("cataract extraction"[MeSH Terms] OR ("cataract"[All Fields] AND "extraction"[All Fields]) OR "cataract extraction"[All Fields] OR ("cataract"[All Fields] AND "surgery"[All Fields]) OR "cataract surgery"[All Fields])) AND ("anti inflammatory agents non steroidal"[Pharmacological Action] OR "anti inflammatory agents, non steroidal"[MeSH Terms] OR ("anti inflammatory"[All Fields] AND "agents"[All Fields] AND "non steroidal"[All Fields]) OR "non-steroidal anti-inflammatory agents"[All Fields] OR "nsaid"[All Fields] OR "nsaids"[All Fields] OR "nsaid s"[All Fields]) AND ("adrenal cortex hormones"[MeSH Terms] OR ("adrenal"[All Fields] AND "cortex"[All Fields] AND "hormones"[All Fields]) OR "adrenal cortex hormones"[All Fields] OR "corticosteroid"[All Fields] OR "corticosteroids"[All Fields] OR

"corticosteroidal"[All Fields] OR "corticosteroide"[All Fields] OR "corticosteroides"[All Fields])) AND ((y_10[Filter]) AND (clinicaltrial[Filter]))

Data retrieval

The authors assessed the studies by reviewing their abstracts and titles to determine their eligibility, selecting relevant ones based on their adherence to the inclusion criteria, which aligned with the article's objectives. A consistent trend observed across multiple studies led to a conclusive result. The chosen submissions had to meet the eligibility criteria of being in English and a full-text.

This systematic review exclusively incorporated literature that met all predefined inclusion criteria and directly pertained to the investigated topic. Studies failing to meet these criteria were systematically excluded, and their findings were not considered. Subsequent analysis examined various details uncovered during the research process, including titles, authors, publication dates, locations, study methodologies, and parameters.

Quality Assessment and Data Synthesis

Each author independently evaluated the research presented in the title and abstract of the publication to determine which ones merited further exploration. The subsequent stage involved assessing all articles that met the predefined criteria for inclusion in the review. Decisions on including articles in the review were based on the findings uncovered during this evaluation process.

Table 1. Article Search Strategy

Database	Strategi Pencarian	Hits
Pubmed	(((("senile"[All Fields] OR "seniles"[All Fields] OR "senility"[All Fields]) AND ("cataract"[MeSH Terms] OR "cataract"[All Fields] OR "cataracts"[All Fields] OR "cataractic"[All Fields] OR "cataractous"[All Fields])) OR ("cataract extraction"[MeSH Terms] OR ("cataract"[All Fields] AND "extraction"[All Fields]) OR "cataract extraction"[All Fields] OR ("cataract"[All Fields] AND "surgery"[All Fields]) OR "cataract surgery"[All Fields])) AND ("anti inflammatory agents non steroidal"[Pharmacological Action] OR "anti inflammatory agents, non steroidal"[MeSH Terms] OR ("anti inflammatory"[All Fields] AND "agents"[All Fields] AND "non steroidal"[All Fields]) OR "non-steroidal anti-inflammatory agents"[All Fields] OR "nsaid"[All Fields] OR "nsaids"[All Fields] OR "nsaid s"[All Fields]) AND ("adrenal cortex hormones"[MeSH Terms] OR ("adrenal"[All Fields] AND "cortex"[All Fields] AND "hormones"[All Fields]) OR "adrenal cortex hormones"[All Fields] OR "corticosteroid"[All Fields] OR "corticosteroids"[All Fields] OR "corticosteroidal"[All Fields] OR "corticosteroide"[All Fields] OR "corticosteroides"[All Fields])) AND ((y_10[Filter]) AND (clinicaltrial[Filter]))	100

Science Direct	(((senile cataract) OR (cataract surgery)) AND (NSAID)) AND (corticosteroid)	150
Sagepub	(((senile cataract) OR (cataract surgery)) AND (NSAID)) AND (corticosteroid)	50
Google Scholar	(((senile cataract) OR (cataract surgery)) AND (NSAID)) AND (corticosteroid)	160

Table 2. JBI Critical appraisal of Study

Parameters	Kim (2021)	Taubenslag (2021)	Ilveskoski (2020)	He (2020)	Erichsen (2021)
1. Bias related to temporal precedence					
Is it clear in the study what is the “cause” and what is the “effect” (ie, there is no confusion about which variable comes first)?	Yes	Yes	Yes	Yes	Yes
2. Bias related to selection and allocation					
Was there a control group?	Yes	Yes	Yes	Yes	Yes
3. Bias related to confounding factors					
Were participants included in any comparisons similar?	Yes	Yes	Yes	Yes	Yes
4. Bias related to administration of intervention/exposure					
Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	No.	No.	No.	No.	No.
5. Bias related to assessment, detection, and measurement of the outcome					
Were there multiple measurements of the outcome, both pre and post the intervention/exposure?	Yes	Yes	Yes	Yes	Yes
Were the outcomes of participants included in any comparisons measured in the same way?	No.	No.	No.	No.	No.
Were outcomes measured in a reliable way?	Yes	Yes	Yes	Yes	Yes
6. Bias related to participant retention					
Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?	Yes	Yes	Yes	Yes	Yes
7. Statistical conclusion validity					

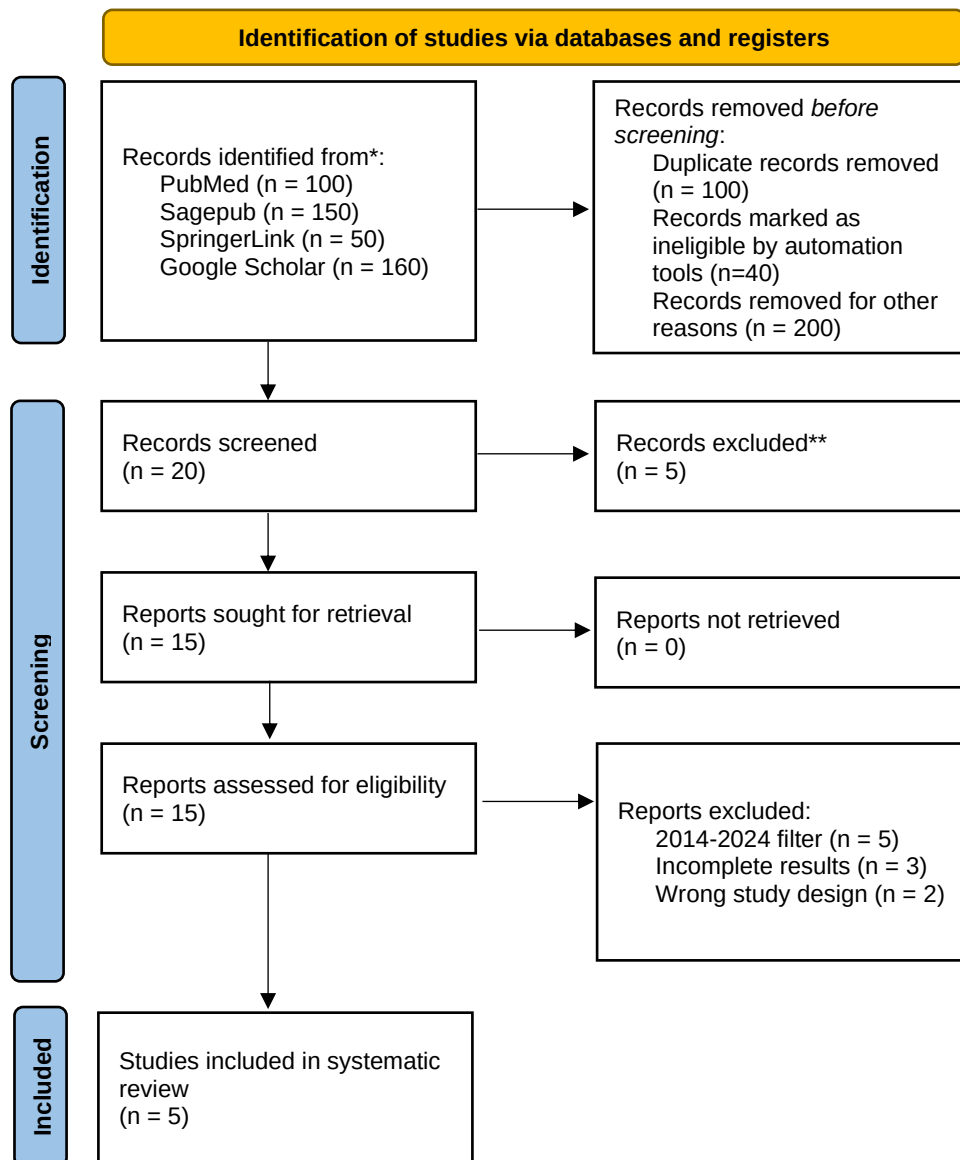


Figure 1. Article search flowchart

Case Management

A 59-year-old male patient presented to Randegansari Husada Hospital, Gresik Regency with chief complaints of blurry vision in his right eye for the past five year, which has worsened in the last month. The patient also reported some blurriness in his left eye, though it is less severe. He described his vision as foggy and denied any redness or pain in his eyes. Over the past three months, the patient has experienced dizziness, especially on the right side of the head. Other symptoms included eye redness and pain, but no itching, tearing, or double vision. Previous general health history is unremarkable.

During the physical examination, the patient's vital signs showed good general condition with pulse 88/min, temperature 36.2°C, respiration rate 18/min, and blood pressure 128/81 mmHg. The right eye examination showed a visual acuity of 1/300, with no correction performed. There were no abnormalities in eye movement, eyelids, conjunctiva, or sclera. The cornea was clear, and the anterior chamber depth was adequate. The iris had crypts but no posterior synechiae. The pupil was round and central with a normal reflex. However, the lens showed overall opacity and positive shadow test. The intraocular pressure (digital) was 40 mmHg. In contrast, the left eye examination showed a visual acuity of 1/60, with no correction performed. There were no abnormalities in eye movement, eyelids, conjunctiva, sclera, cornea, or iris. The pupil was round and central with a normal reflex. The lens was partially cloudy, and the intraocular pressure (digital) was 20 mmHg. Clinical examination of the eyes are shown in Figure 1.



Figure 1. Clinical examination of the eye

The laboratory results showed complete blood count with hemoglobin at 13.20 g/dL (low), hematocrit at 38.0% (low), and MCHC at 34.7 g/L (high), with monocytes at 12.6% (high). Other values were within normal ranges. Blood chemistry results included blood glucose at 108 mg/dL, creatinine at 0.81 mg/dL, urea at 22 mg/dL, SGOT at 27 U/L, SGPT at 22 U/L, and HBsAg was non-reactive. The ECG showed sinus bradycardia, minimal voltage criteria for LVH, and was considered borderline. The chest X-ray revealed no abnormalities in the lungs or heart. Eye USG results are shown in Figure 2. The patient was diagnosed with a The diagnosis was immature senile cataract in both eyes with secondary glaucoma.

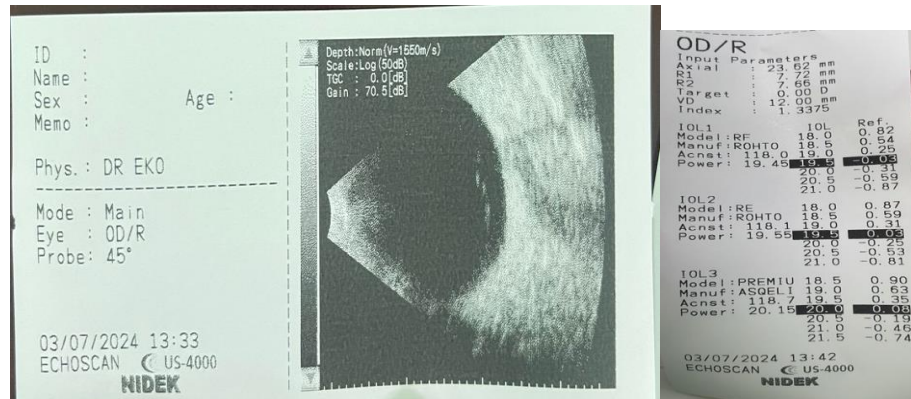


Figure 2. Eye USG

The patient was planned for phacoemulsification surgery intraocular lens (IOL) and capsular tension ring (CTR) for the right eye (Figure 3). The patient was prepared for surgery with RL infusion at 20 drops/min, injection ceftriaxone 1 amp every 12 hours, injection dexamethasone 1 amp every 8 hours, acetazolamide 250 mg 3 times daily, KSR 600 mg once daily, sodium diclofenac eye drops 3 times daily, and timolol 0.25% eye drops twice daily. Non-medication interventions include educating the patient about cataracts and recommending lifestyle modifications such as reducing risk factors, maintaining a healthy diet, and regular exercise.

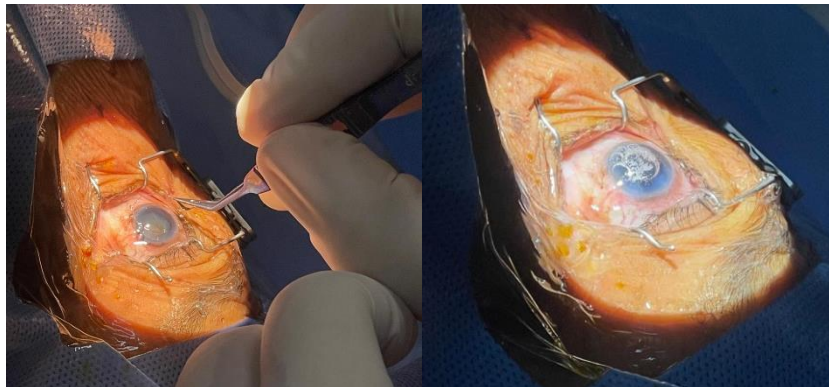


Figure 3. Phacoemulsification surgery with intraocular lens (IOL) and capsular tension ring (CTR)

On the first post-operative day, visual acuity had improved slightly. The patient reported no postoperative pain or dizziness, and a reduction in eye pain. There were no abnormalities in eye movement, eyelids, conjunctiva, or sclera. The cornea was clear, the anterior chamber depth was adequate, and the iris and pupil

were normal (Figure 4). The lens was clear, and the intraocular pressure was 30 mmHg for the right eye and 23 mmHg for the left eye. The assessment indicated a successful phacoemulsification surgery with IOL and CTR implantation. The treatment plan included various medications and eye drops to support recovery.

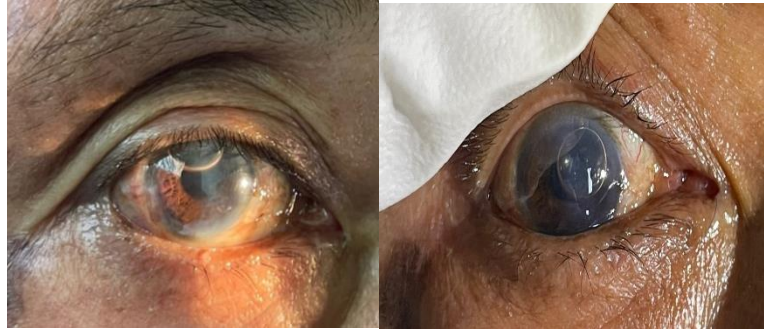


Figure 4. Post operative day 1

A post operative examination on day 7 showed continued improvement with clearer vision with no throbbing eye pain (Figure 5). The assessment noted right eye pseudophakia and glaucoma. The treatment plan was adjusted to include antibiotics, anti-inflammatory medications, and specific eye drops to manage glaucoma and aid in healing. The patient's visual acuity was noted as 1/2 / 60 for the right eye and 1/60 for the left eye, with intraocular pressures of 32 mmHg and 20 mmHg, respectively.

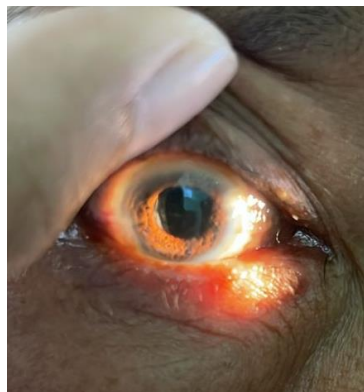


Figure 5. Post operative day 7

After one month, the patient's visual acuity had further improved to 5/12. Both eyes move well in all directions with no abnormalities in the eyebrows, eyelids, conjunctiva, or sclera. The cornea is clear, and the anterior chamber depth is adequate. The right iris shows no crypts or posterior synechiae. The right lens is

clear with a negative shadow test, with an intraocular pressure of 32 mmHg for the right eye and 15 mmHg for the left eye (Figure 6).

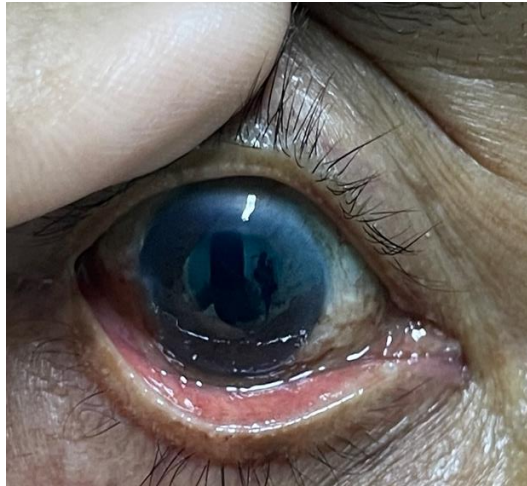


Figure 6. Post operative day 30

The prognosis is good for overall health (ad vitam), function (ad fungsionam), and recovery (ad sanationam). Further tests such as biometry for surgical preparation, blood tests for surgical safety, blood glucose to check for diabetes, and an EKG for cardiac evaluation are recommended. Non-medication management also includes advising the patient to manage diet to reduce blood glucose and slow the progression of cataracts.

RESULT

The initial number of articles retrieved from online databases (PubMed, SagePub, SpringerLink, and Google Scholar) is 360 articles. After conducting three levels of screening, five articles that directly relate to the current systematic review have been chosen for further assessment through full-text reading and analysis. Table 1 presents the selected literature included in this analysis.

Table 1. The literature included in this study

No.	Author	Origin	Method	Sample	Result
1.	Kim, et al. ¹¹ (2021)	South Korea	Retrospective cohort study	241,062 patients	The study involved 241,062 patients, with 127,941 in the cataract surgery group and 113,121 in the cataract diagnosis group. The incidence of all-cause mortality was 3.62 deaths per 100 person-years in the cataract surgery group and 3.19 deaths per 100 person-years in the cataract diagnosis group. After adjusting for demographics, systemic, and ocular comorbidities, cataract surgery was associated with a 7% reduction in the hazard of all-cause mortality (HR 0.93; $p < 0.001$). Additionally, cataract surgery was linked to decreased mortality from vascular (HR 0.92; $p < 0.001$) and neurologic (HR 0.64; $p < 0.001$) causes.
2.	Taubenslag, et al. ¹² (2021)	USA	Retrospective cohort study	40 patients	While combining NSAIDs and corticosteroids is common in cataract surgery, there is limited evidence for improved long-term visual outcomes from NSAIDs. Recent data suggest potential benefits from pretreatment with NSAIDs before surgery, and new "dropless" delivery systems show promise. However, optimal pharmacologic treatment for postoperative inflammation remains controversial. A consensus definition for clinically significant CME and well-designed trials are needed to compare anti-inflammatory drugs and refine treatment approaches.
3.	Ilveskoski, et al. ¹³ (2020)	Finland	Retrospective cohort study	60 patients	In routine cataract surgery for patients with pseudoexfoliation syndrome (PXF), treatment with nonsteroidal anti-inflammatory drugs (NSAIDs) alone or in combination with steroids resulted

					in faster recovery and reduced risk of pseudophakic cystoid macular edema (PCME) compared to steroids alone. At 28 days, central subfield macular thickness increased more significantly in the prednisolone acetate group compared to the nepafenac and combination therapy groups. By 3 months, macular thickness remained higher in the steroid monotherapy group, while the combination group showed the most stability. Additionally, the prednisolone acetate group experienced longer durations of conjunctival injection and eye irritation compared to the NSAID and combination therapy groups.
4.	He, et al. ¹⁴ (2020)	Nanchong, China	Retrospective cohort study	102 patients	Postoperative scores for subjective vision, peripheral visual field, visual adaptation, stereo vision, and total visual function were significantly higher at both 3 days and 3 months compared to preoperative scores ($P<0.05$). Additionally, postoperative self-care ability, mobility, psychological states, social ability, and total quality of life scores improved significantly at both time points ($P<0.05$). Independent risk factors for reduced visual function post-phacoemulsification included age (≥ 80), preoperative corrected visual acuity (<0.1), history of glaucoma, postoperative corneal edema, fundus lesions, and longer phacoemulsification time ($P<0.05$). Visual function indices were positively correlated with quality of life ($P<0.05$).
5.	Erichsen, et al. ¹⁵ (2021)	Denmark	Retrospective cohort study	456 patients	The study included 456 participants with an average age of 72.1 years, 62% of whom were women. Postoperative flare increased more

					significantly in the dropless group compared to the control group, but no other groups showed significant differences. Intraocular pressure decreased in all groups, though it decreased less in groups using prednisolone eyedrops. There were no differences in postoperative visual acuity.
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Kim, et al.¹¹ (2021) concluded that cataract surgery showed the greatest reductions in mortality were observed in patients aged 85 and older, women, those with lower income, a Charlson comorbidity index score of 5 or more, and those without glaucoma.

Taubenslag, et al.¹² (2021) showed that combining NSAIDs and corticosteroids is common in cataract surgery, there is limited evidence for improved long-term visual outcomes from NSAIDs. Recent data suggest potential benefits from pretreatment with NSAIDs before surgery, and new "dropless" delivery systems show promise.

Ilveskoski, et al.¹³ (2020) showed that NSAID monotherapy or combination therapy may offer better postoperative outcomes for cataract surgery patients, particularly in managing inflammation and preventing complications like PCME.

He, et al.¹⁴ (2020) concluded that phacoemulsification significantly improves the short-term visual function and quality of life for patients with senile cataracts. However, advanced age, poor preoperative visual acuity (<0.1), a history of glaucoma, postoperative corneal edema, fundus lesions, and longer surgery duration are independent risk factors that can negatively impact visual outcomes. Patients with these high-risk factors should receive enhanced clinical intervention and evaluation to minimize the risk of poor postoperative vision.

Erichsen, et al.¹⁵ (2021) suggest that NSAID monotherapy and NSAID-steroid combination therapy were equally effective in controlling early inflammation after cataract surgery, while sub-Tenon dexamethasone was less effective. Prophylactic eyedrops prior to surgery did not impact early postoperative inflammation.

DISCUSSION

The management of inflammation post-cataract surgery, especially in patients with complicating factors such as secondary glaucoma, remains a critical aspect of achieving optimal visual outcomes. In the presented case report, a 59-year-old male with senile cataract and secondary glaucoma underwent phacoemulsification surgery with intraocular lens (IOL) and capsular tension ring (CTR) implantation. The case highlighted the importance of postoperative anti-inflammatory management, given the presence of high intraocular pressure (IOP) and potential risks of postoperative inflammation and complications.¹⁴

Systematic review findings underscore that nonsteroidal anti-inflammatory drugs (NSAIDs) alone or in combination with steroids generally result in faster recovery and a lower incidence of pseudophakic cystoid macular edema (PCME) compared to steroid monotherapy. This is consistent with Ilveskoski et al. (2020), who reported that patients receiving NSAID therapy experienced better control of postoperative inflammation and fewer complications.¹³ In the case report, the patient's postoperative care included sodium diclofenac eye drops, which align with these findings, emphasizing the importance of NSAID use in managing inflammation and improving outcomes.

Further support for the combined use of NSAIDs and corticosteroids comes from Taubenslag et al. (2021), who pointed out that while both drug classes are commonly used, there remains limited evidence for improved long-term visual outcomes solely from NSAIDs.¹² However, the potential benefits of pretreatment and newer dropless delivery systems offer promising alternatives to traditional eye drops, which could improve patient adherence and outcomes, particularly in cases complicated by secondary glaucoma as seen in the current patient.^{16,17}

Erichsen et al. (2021) provided additional insights, showing that NSAID-steroid combination therapy was equally effective in controlling early inflammation after cataract surgery.¹⁵ This finding is mirrored in the current case where combination therapy was used successfully to manage postoperative inflammation and reduce intraocular pressure. The patient's positive recovery trajectory, including the resolution of eye redness and pain by day seven, and improved visual

acuity by day 30, further highlights the effectiveness of this combined pharmacological approach.^{18,19}

He et al. (2020) emphasized that advanced age, history of glaucoma, and other preoperative risk factors could negatively impact visual outcomes. In the case report, the patient's secondary glaucoma posed a significant risk; however, the comprehensive surgical and medical management approach, including enhanced clinical interventions and individualized care, likely contributed to the patient's favorable prognosis.^{20,21}

Finally, Kim et al. (2021) suggested that cataract surgery could reduce mortality, especially in older adults with multiple comorbidities. While the current patient had an unremarkable general health history, the case underscores the importance of cataract surgery not only for visual rehabilitation but also for its potential impact on broader health outcomes.¹⁸

In conclusion, the case report and systematic review findings collectively emphasize the need for individualized postoperative inflammation management in cataract surgery patients, particularly those with complicating factors like secondary glaucoma. Combining NSAIDs and corticosteroids, possibly with newer delivery systems, appears beneficial for managing inflammation and ensuring optimal recovery.²²

CONCLUSION

Combining NSAIDs and corticosteroids shows promise in managing postoperative inflammation and reducing intraocular pressure after cataract surgery. Newer delivery systems may further enhance recovery outcomes and improve patient care.

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