

The Effect of 0.1% Nevanac on Macular Thickness and Volume after Uncomplicated Cataract Surgery

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Original Research Article

ABSTRACT

Aim: The study aimed to evaluate the effect of 0.1% Nevanac drops used after uncomplicated cataract surgery on central macular thickness (CMT) and total macular volume (TMV).

Study Design: Observational study.

Place and duration study: Ahi Evran University Training and Research Hospital's Eye Clinic, between January-February 2018.

Methodology: This study included 60 eyes of 60 patients who underwent cataract surgery. Phaco surgery under topical anaesthesia was performed on all patients. The eyes were randomly divided into two groups after the surgery. Only standard topical medication was administered to the control group (32 eyes) while standard topical medication, as well as topical Nevanac 0.1% TID, were used for the Nevanac group (28 eyes) for one month. The patients' preop, postop, 1st week and 1st-month CMT and TMV were measured automatically by optical coherence tomography (OCT). A p-value <0.05 was accepted as statistically significant value.

Results: When both groups were evaluated in terms of CMT, no statistically significant difference was present between the preop, 1st week and 1st-month measurements (p= 0.337, p= 0.742, p= 0.921, respectively). When the two groups were compared regarding TMV, no statistically significant difference was found between preop, 1st week and 1st-month measurements (p= 0.729, p= 0.13, p=

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0.105, respectively). As regards CMT, there was no significant difference between preop values and 1st week and 1st- month measurements in the Nevanac group, but a significant difference was present between the preop measurements and first- month measurements in the control group ($p<0.001$). When the total macular volumes were compared in the Nevanac group, a statistically significant difference was found between the preop and 1st- month measurements ($p<0.001$). A statistically significant difference was found between the preop values and both the 1st week and 1st- month measurements in the control group ($p<0.001$).

Conclusion: In conclusion, central macular thickness and total macular volume showed a small increase compared to preop values when 0.1% Nevanac was used after uncomplicated cataract surgery.

Keywords: *[Please put four to eight keywords]*

1. INTRODUCTION

Phacoemulsification techniques and intraocular lens implantation (IOL) provide better visual results after cataract surgery. However, the most common cause of visual loss after cataract surgery is cystoid macular edema (CME). A previous randomised controlled clinical multi-centre trial called “The PREvention of Macular EDema after cataract surgery (PREMED) study” compared the efficiency of topical NSAID, topical corticosteroid, and the combination of them in nondiabetic patients. The ESCRS PREMEd study aimed to reveal evidence- based information that might make a contribution to clinical guidelines on the prevention of CME after cataract surgery [1]. Topical nonsteroidal anti-inflammatory drugs (NSAIDs) have been used as standard therapy to treat both preoperative and postoperative inflammation and support full recovery of optimal visual acuity [2,3]. NSAIDs are strong inhibitors of cyclooxygenase (COX) enzymes and inhibit the production of proinflammatory prostaglandin, which increases vasodilatation and vascular permeability [4]. NSAIDs are therefore used to protect pupillary dilation during cataract surgery, decrease postoperative pain, control inflammation both during and after surgery, and inhibit the development of CME after surgery [5-7].

The effect of NSAIDs on macular thickness is a significant clinical concern as macular thickening may impact visual acuity outcomes [8,9]. Wittpenn et al. reported that the addition of an NSAID to a postoperative regimen significantly reduced the incidence of macular thickening [8].

Nepafenac ophthalmic suspension (Alcon Research, Ltd., Fort Worth, TX) is a topical ocular NSAID. Unlike other ocular NSAIDs, nepafenac is a prodrug and has very little activity. Once loading is complete, penetration is

rapid, and it is deaminated by hydrolase inside the ocular tissues for the formation of the active metabolite amfenac [10]. Amfenac is a strong inhibitor of COX enzymes [11]. Hydrolases are found especially in the iris, ciliary body, retina and choroid where prostaglandin concentrations and COX activities are the highest [12].

The study aimed to investigate the effect of 0.1% Nevanac used in addition to the standard medication after uncomplicated cataract surgery on the central macular thickness and total macular volume in this study.

2. MATERIALS AND METHODS

This observational study included 60 eyes of 60 patients who underwent routine cataract surgery during January-February 2018. This study was conducted at Ahi Evran University Training and Research Hospital's Eye Clinic following the Helsinki Declaration. The study protocol was approved by the Ahi Evran University Faculty of Medicine Clinical Research Ethics Committee (Ethical approval number: 2017-1095). Patients who underwent complicated cataract surgery due to vitreoretinal pathology, diabetes mellitus (DM), uveitis, glaucoma, prostaglandin use, vitreous loss, or posterior capsule rupture were excluded from the study. The patients with a history of topical or systemic NSAID use were also excluded. Patients with macular changes and media opacities affecting the OCT image were also excluded from the study.

The patients underwent a complete ophthalmologic examination involving visual acuity measurement with the Snellen chart, intraocular pressure measurement (Goldmann Aplanasyon Tonometry, IOP: 11-21 mmHg), biomicroscopy, and fundus examination (pupil was dilated and examined). The phacoemulsification surgery (Infinity Vision

System, Alcon) and IOL implantation (Acrysof IQ Monofocal, Alcon, USA) were performed under topical anaesthesia by a single surgeon in all patients. The eyes were randomly divided into two groups after surgery. Only standard topical medication was administered to the control group (32 eyes) while standard topical medication, as well as topical Nevanac 0.1% TID, were used for the Nevanac group (28 eyes) for one month. Both groups were administered Moxifloxacin 2% four times daily and Prednisolone 0.1% every 4 hours for a total of 3 weeks as the standard topical medication. The patients' preop, postop, 1st week and 1st- month central macular thickness (μm , central area 1 mm in diameter) and total macular volumes (mm^3) were measured automatically by OCT (Heidelberg Engineering, Germany).

2.1 Statistical Analysis

The SPSS version 20.0 (IBM Software Group, Chicago, IL; 60606 USA) software was used for statistical analyses. The Kolmogorov–Smirnov test was used to evaluate normal distribution. The independent samples t- test was used to compare data between the two groups. The one-way ANOVA test was used for intergroup comparison variables for repeated measures. Correction of the p- value was performed with the Bonferroni method. The statistical level of significance was accepted at $p < 0.05$.

3. RESULTS

The mean age was 64.21 ± 8.64 years in the Nevanac group and 66.81 ± 8.24 years in the control group ($p = 0.239$). The Nevanac group consisted of 28 patients (4 females and 24 males) and the control group consisted of 32 patients (9 females and 23 males) ($p = 0.194$). The mean preop visual acuity was 0.14 ± 0.1 in the Nevanac group and 0.24 ± 0.12 in the control group while the mean postop visual acuity was 0.87 ± 0.17 in the Nevanac group and 0.95 ± 0.7 in the control group ($p = 0.003$, $p = 0.021$, respectively). The clinical and demographic characteristics of the patients are shown in Table 1.

Regarding the CMT values, there was no statistically significant difference between the two groups for preop, 1st week and 1st- month measurements ($p = 0.337$, $p = 0.742$, $p = 0.921$, respectively, Table 2). Similarly, there was no statistically significant difference between the groups for preop, 1st week and 1st- month TMV

measurements ($p = 0.729$, $p = 0.13$, $p = 0.105$, respectively, Table 3).

Table 1. The clinical and demographic characteristics of the patients

	Nevanac group Mean$\pm$SD	Control group Mean$\pm$SD	p
Age (y)	64.21 $\pm$ 8.64	66.81 $\pm$ 8.24	.239
Gender (F/M)	4/24	9/23	.194
VO (preop)	0.14 $\pm$ 0.1	0.24 $\pm$ 0.12	.003
VO (postop)	0.87 $\pm$ 0.17	0.95 $\pm$ 0.7	.021

VO: Visual Acuity, y:year

There was no significant difference between the preop values and the 1st week and 1st- month measurements for CMT in the Nevanac group, but a significant difference was present between the preop measurements and first- month measurements in the control group ($p < 0.001$, Table 4). The CMT decreased mildly in the Nevanac group in the 1st week while showing a mild increase in the control group. However, these differences were not significant in either group.

A statistically significant difference was found between the preop and 1st- month TMV measurements in the Nevanac group ($p < 0.001$). A statistically significant difference was also found between the preop TMV values and both the 1st week and 1st- month measurements in the control group ($p < 0.001$, Table 5). There was a decrease in TMV in the 1st week that was not statistically significant in the Nevanac group, but a statistically significant increase was found in the control group in the same period.

While the mean difference in TMV between the preop and 1st- month measurements was only 0.10 mm^3 in the Nevanac group, it was 0.31 mm^3 in the control group. The difference in CMT values between the preop and 1st- month measurements was 2 microns and not significant in the Nevanac group and 10 microns and significant in the control group.

4. DISCUSSION

Macular thickness has been shown to increase compared to the preoperative values after cataract surgery, even if it is uncomplicated. Biro et al. have reported foveal and perifoveal thickness to increase significantly within the 1st week, 1st- month and the 2nd month following uncomplicated cataract surgery [13]. Cagini et al.

observed asymptomatic increases in macular thickness and volume 12 weeks after surgery [14]. Several studies have reported increased macular thickness in 27-41% of the eyes that underwent phacoemulsification [15,16]. The effect of postoperative NSAIDs on macular edema development after phacoemulsification has been evaluated in prospective studies [17-20].

Two prospective studies have shown CME not to cause decreased vision despite a 9% increase in mean fovea thickness with OCT at the postop 6th week and a 9% increase in the angiographic CME incidence [21,22]. The macular thickness evaluated with OCT in patients without CME peaks at about 4 to 6 weeks postoperatively [23-25]. Therefore, measurements were done at the postop 4th week.

Mathys et al. found an increase of 5.6 microns between preop and postop central macular thickness in their 0.1% Nevanac group. A mean increase of 2 microns between the preop and postop was found in the 1st month measurements in the Nevanac group. The increase in the control group was 2.78 microns and not statistically significant in the work by Mathys et al. [26]. It was 10 microns and statistically significant in the present study ($p<0.001$). Mathys et al. [26] also compared the TMV values between the Nevanac and control groups and found an increase of 0.1 mm³ in the Nevanac group. As regards the control groups, there was a statistically insignificant ($p>0.05$) 0.05 mm³ increase in the study by Mathys et al. [26]. The present study found a statistically significant 0.31 mm³ increase ($p<0.001$, Table 6).

Table 2. Central macular thickness analyses

	Nevanac group Mean±SD	Control group Mean±SD	p
Preop CMT (μm)	276.75±27.36	269.65±20.09	.337
1st week CMT (μm)	273.78±26.42	271.21±32.68	.742
1st month CMT (μm)	278.64±26.25	279.50±38.06	.921

CMT: Central macular thickness, μ: micron, SD: Standard deviation

Table 3. Total macular volume measurements

	Nevanac group Mean±SD	Control group Mean±SD	p
Preop TMV (mm ³)	8.56±0.77	8.62±0.39	.729
1st week TMV (mm ³)	8.54±0.74	8.78±0.42	.130
1st month TMV (mm ³)	8.66±0.74	8.93±0.50	.105

TMV: Total macular volume, SD: Standard deviation

Table 4. CMT comparisons of the groups

	Preop Mean±SD	1st week Mean±SD	1st month Mean±SD	p
Nevanac group (μm)	276.75±27.36	273.78±26.42	278.64±26.25	.000(1st week and 1st month)
Control group (μm)	269.65±20.09	271.21±32.68	279.50±38.06	.000(preop/1st month and 1st week/1st month)

CMT: Central macular thickness, μ: micron, SD: Standard deviation

Table 5. TMV comparison of the groups

	Preop Mean±SD	1st week Mean±SD	1st month Mean±SD	p
Nevanac group (mm ³)	8.56±0.77	8.54±0.74	8.66±0.74	.000(1st week and 1st month)
Control group (mm ³)	8.62±0.39	8.78±0.42	8.93±0.50	.000(preop/1st month and 1st week/1st month)

TMV: Total macular volume, SD: Standard deviation

Table 6. Comparison of TMT, TMV measurements of previous studies

	Nevanac (TMT,μ)	Control (TMT,μ)	Nevanac(TMV,mm³)	Control (TMV,mm³)
Mathys et al.	5.6 [*]	2.78 [*]	0.1 [*]	0.05 [*]
Campa et al.	8 [*]	17 [*]	-	-
Tzelikis et al.	8 [*]	18 [*]	0.2 [*]	0.35 [*]
Zaczek et al.	-	-	0.12 [*]	0.34 [*]

**: Difference between before and after surgery.*

Campa et al. compared preop and the postop 5th-week central macular thickness and found an increase of about 8 microns in the Nevanac group similar to the present study while there was an increase of about 17 microns in the control group [27]. In contrast to the present study, they found a statistically significant increase in CMT from the preop to the postop 1st month between the Nevanac group and the control group (p= 0.04, Table 6).

Tzelikis et al. measured CMT in their study conducted with 0.3% Nevanac and found an increase of about 8 microns between measurements made preop and at the 5th week in the Nevanac group similar to the present study while the increase was about 18 microns in the control group [28]. They also found an increase in TMV of 0.2 mm³ in the Nevanac group and 0.35 mm³ in the control group. Although the results of the Tzelikis et al. study and this study are similar, the Nevanac concentration and dose used were different [28]. Zaczek et al. similarly reported a TMV increase of 0.12 mm³ in the 0.1% Nevanac group similar to this study and 0.34 mm³ in the control group at the third week [29] (Table 6).

A statistically significant increase in the visual acuity of patients was found in both the Nevanac and the control groups, similar to the results of Campa et al. [27] and Tzelikis et al. [28]. The visual acuities of the fourth week of both groups were compared and found a statistically significant increase in both groups. Because of the increase in cataract surgery, it was not evaluated as nevanac effect.

5. CONCLUSIONS

While no statistically significant difference was found between preop and the postop, 1st week and 1st month CMT measurements, after uncomplicated cataract surgery in the Nevanac group, a statistically significant difference was present between preop and the postop 1st month CMT measurements in the control group (p<0.001). A statistically significant difference was found between preop and the 1st month

TMV measurements in the Nevanac group and between preop and both the 1st week and 1st month TMV measurements in the control group (p<0.001). This study shows that postoperative nepafenac use limits the total central macular thickness and macular volume increase. Therefore, the use of nepafenac will be useful in decreasing the possibility of developing postoperative pseudophakic CME.

CONSENT

As per international standard or university standard was written participant consent has been collected and preserved by the authors.

ETHICAL APPROVAL

The study protocol was approved by the Ahi Evran University Faculty of Medicine Clinical Research Ethics Committee (Ethical approval number: 2017-1095).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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