Case Report / *Olgu Sunumu*

DOI: 10.4274/haseki.35744
Med Bull Haseki 2017;55:243-7

Nonarteritic Ischemic Optic Neuropathy Due to the Increased Intraocular Pressure During Cataract Surgery: A Case Report

Katarakt Cerrahisi Sırasında Göz İçi Basınç Artışına Bağlı Gelişen Nonarteritik İskemik Optik Nöorapati Olgusu

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Abstract

A 46-year-old patient diagnosed with rheumatoid arthritis underwent cataract surgery for a subcapsular cataract. Perioperative intraocular pressure (IOP) increased after two sideport incisions. Despite administration of 300 cc of 20% mannitol, the elevated IOP persisted for 30 minutes. IOP decreased after pressing the posterior surface of the sideports with a 25 G cannula. The other steps of cataract surgery and intraocular lens implantation were performed uneventfully. On the first postoperative day, the diagnosis of nonarteritic ischemic optic neuropathy (NAION), which was thought to be the result of increased IOP in the perioperative period, was recorded. Cataract surgeons keep in mind and urgently perform simple maneuvers to lower IOP in order to prevent unexpected vision-threatening complications, such as NAION. In addition, for patients who have a crowded optic nerve head with a small cup-to-disc ratio or a previous episode of NAION in the other eye, perioperative and postoperative ocular pressure must be attentively managed.

Keywords: Cataract surgery, optic neuropathy, complication

Öz

Romatoid artrit tanılı 46 yaşında erkek hastaya subkapsüler katarakt nedeni ile katarakt cerrahisi uygulandı. İki yan port insizyonu sonrası göz içi basıncında (GİB) artış saptandı. %20 mannitol 300 cc tedavisine rağmen, GİB yüksekliği 30 dakika devam etti. GİB, yan portların arka yüzeyine 25 G kanül ile bası uygulanarak düşürüldü. Cerrahinin diğer aşamaları sorunsuz bir şekilde tamamlandı. Cerrahi sonrası birinci gün, peroperatif GİB artışı sonucu geliştiği düşünülen nonarteritik iskemik optik nöropati (NAİON) tanısı konuldu. NAİON gibi görmeyi tehdit edebilecek beklenmedik komplikasyonlardan kaçınmak için katarakt cerrahları, GİB düşürücü basit manevraları her zaman hatırlamalı ve hızlıca uygulamalıdırlar. Ek olarak, küçük çukurluk/disk oranına sahip sıkışık optik disk başı olan hastalar veya diğer gözde geçirilmiş NAİON öyküsü bulunan hastalarda, peroperatif ve peroperatif göz içi basıncı özenle takip edilmelidir.

Anahtar Sözcükler: Katarakt cerrahisi, optik nöropati, komplikasyon

Introduction

Cataract surgery is the most common eye procedure in older patients. With increasing surgical experience and developing technology, complications due to surgery have decreased. Cataract surgery is performed on patients for refractive aims and to improve low vision. However, tolerance to complications decreases with increasing expectations. Although regarded as a safe surgery, many complications can develop which threaten vision, including nucleus drop, endophthalmitis, and corneal decompensation. Complications can be related to the experience of the surgeon, techniques, and devices used, the sterilization conditions, and patient-related factors.

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Received/Geliş Tarihi: 23 March 2017 **Accepted/Kabul Tarihi:** 02 May 2017

This study was presented in 34th Congress of the ESCRS on September 10-14, 2016 in Copenhagen, Denmark.

Neuroophthalmologic complications secondary to cataract surgery is rarely encountered.

Nonarteritic ischemic optic neuropathy (NAION) is the most frequently diagnosed acute optic neuropathy in adults over 50 years of age. Diagnostic criteria are sudden loss of vision frequently accompanied by altitudinal visual field defects, optic nerve head oedema, relative afferent pupillary defect and excluding other acute optic neuropathies (1). In two studies conducted in people over the age of 50, the incidence of NAION development was estimated to be 2.3 and 10.2 per 100.000 people (2,3). The rate of NAION development after cataract surgery has been reported as 0.2%, which indicates increased NAION risk with cataract surgery (4). Even though intravenous methylprednisolone is frequently used in treatment, its efficacy has not been proven by randomized large-scale trials (5).

Here, we present a patient with NAION secondary to increased intraocular pressure (IOP) during cataract surgery.

Case

A 46-year-old male patient with a previous diagnosis of rheumatoid arthritis underwent bilateral cataract surgery for posterior subcapsular cataract secondary to steroid treatment. Surgery was performed with topical anesthesia using 0.5% proparacaine hydrochloride (Alcaine, Alcon, USA) eye drop. Preoperative corrected distance visual acuity (CDVA) of the right eye and left eye were 10/50 and 20/50, respectively. IOP of the right and left eye was 14 and 15 mmHg, respectively. Biomicroscopic examination revealed no pathology except posterior subcapsular cataract. Fundus examination revealed normal optic nerves with a small cup-disc ratio. The patient was diagnosed with rheumatoid arthritis 10 years ago and was medicated with steroid treatment. There was no history of ocular involvement or examination findings of rheumatoid arthritis related ocular involvement, such as uveitis, scleritis, and episcleritis. After surgery of the right eye, the CDVA was 50/50 and ophthalmic examination was normal. The left eye surgery was performed one week after the right eye surgery. Perioperative IOP increased after two sideport incisions (Figure 1). Iris also had a tendency to prolapse from the sideports. Intravenous mannitol infusion was given because IOP did not decrease after the anterior chamber discharging procedure. Despite 300 cc of 20% mannitol administration, elevated IOP persisted for 30 minutes. IOP decreased when the posterior surface of the sideports were pressed with a 25 G cannula by a more experienced surgeon. After IOP decreased, the other steps of the cataract surgery and intraocular lens implantation were performed uneventfully. CDVA on the postoperative first day was 10/50. IOP was 14 mmHg for both eyes. Optic disc swelling, leakage from the optic disc at late phases on fundus fluorescein angiography, thickening of the retinal nerve fiber layer, and enlargement of the blind spot on visual field were detected (Figures 2, 3, 4). The patient was diagnosed with NAION. The natural course of the disease and treatment options were discussed with the patient and steroid treatment was deemed to be the choice of treatment.

For three days, we administrated intravenous 1 gr methylprednisolone, and for one month, we administrated oral methylprednisolone with dose tapering. CDVA was 20/50 and 30/50 after three days and one month of treatment, respectively. One year later, CDVA was 50/50

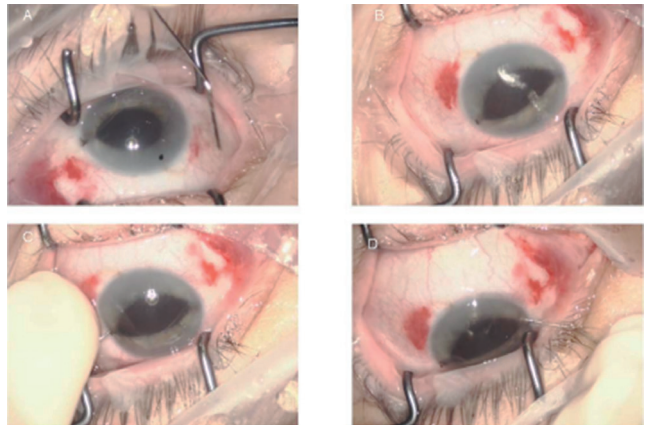

Figure 1. A) Iris prolapses after nasal sideport incision, B) Iris prolapses out of two sideports, C) Pressing posterior surface of the incision with a 25 G cannula on nasal sideport, D) Pressing posterior surface of the incision with a 25 G cannula on temporal sideport

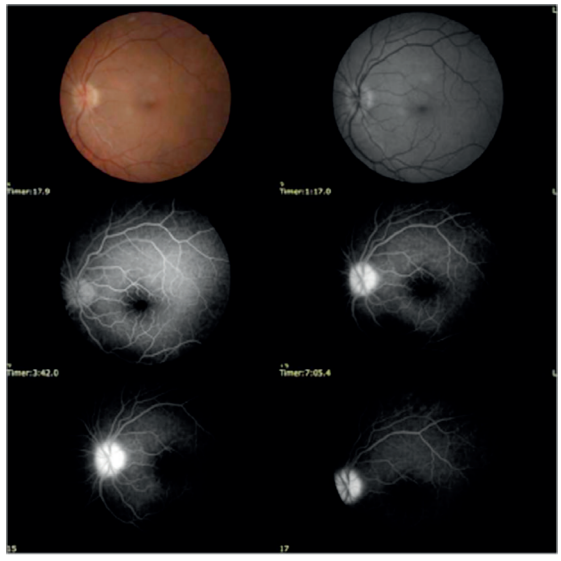

Figure 2. Fundus fluorescein angiography of the left eye on postoperative first day showing hyperfluorescence of the disc at the late stage

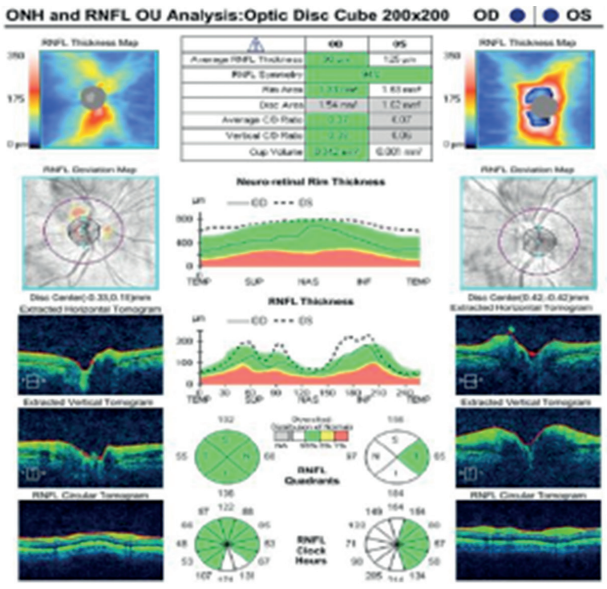

Figure 3. Optical coherence tomography image of the left eye on postoperative first day showing an increase of the nerve fiber thickness due to the optic disc swelling
ONH: Optic nerve head, RNFL: Retinal nerve fiber layer, OU:Both eyes, OD: Right eye, OS: Left eye

and visual field examination and optic disc nerve analysis was normal.

Discussion

NAION is the most common form of anterior ischemic optic neuropathy and is usually the result of transient insufficiency of the oxygen supply in the choroid encircling the optic disk (6). Decreased perfusion pressure, reduced oxygen-carrying capacity, and increased resistance to blood flow results in decreased oxygen delivery. The difference between arterial pressure and venous pressure or IOP if that exceeds venous pressure composes the perfusion pressure of the optic nerve head. Hypertension, diabetes mellitus, hypercholesterolemia, ischemic heart disease, coagulopathies, acute blood loss, anemia, hypotension, nocturnal hypotension, cerebrovascular diseases, migraine, and sleep apnea have been identified as systemic risk factors for the development of NAION (5,7,8).

Our patient had rheumatoid arthritis which might have predisposed him to NAION. We know that inflammatory diseases, such as rheumatoid arthritis are associated with NAION (8).

There are several reports of NAION after non-ocular surgeries. Systemic perioperative risk factors of NAION are; increased venous pressure after head and neck surgery (9), spinal fusion surgery (10), excessive blood loss (11), intraoperative hypotension secondary to cardiopulmonary bypass surgery (12), high-volume crystalloid loading

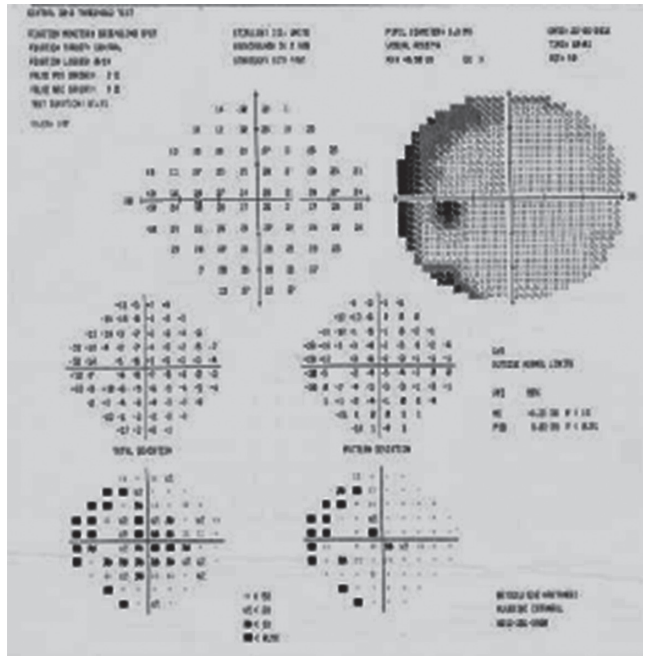

Figure 4. Enlargement of the blind spot on visual field

(13,14), prone position with head-down posture (14, 15), and any pathology that may cause intraoperative hypotension (16). The main perioperative ocular risk factor of NAION is increased IOP during surgery (17). According to our knowledge, the development of NAION due to topical anesthesia has not been reported in the literature. Only increased IOP was present as perioperative risk factor in our patient.

The risk of developing NAION, in the fellow eye of patients who had unilateral NAION, has been found to be 18% within one year and 35% within five years (18). Increased IOP, small optic disc, and small optic cup are ocular risk factors for NAION. Small scleral canal diameter has been shown to cause axonal congestion in the lamina cribrosa level in eyes with small optical disc and small optic cup (17). This leads to a decrease in regional blood flow leading to infarction of the optic nerve head (19).

Increased IOP in the first 24 hours after cataract surgery plays an important role in the pathophysiology of early-onset NAION. Early-onset NAION after cataract surgery occurs within a few days after surgery (1,20); whereas, delayed NAION occurs weeks or months after surgery (21-24). Early-onset NAION is known to be associated with increased IOP, but evidence for surgical linkage in delayed NAION is inadequate (25). If NAION develops in one eye after cataract surgery, the risk of developing NAION after subsequent cataract surgery in the fellow eye has been reported to be 30-50% (18,26).

Ocular hypotensive effect for intravenous infusion of mannitol begins within 30 minutes. In our case, IOP did

not decreased even 30 minutes after mannitol infusion. IOP decreased after pressing sideports with a cannula by another surgeon. The experience of the surgeon may have influenced the success of the maneuver. We think that increased IOP, which persists for 30 minutes during the operation, is the main reason for the early onset of NAION. We assume that the main reason for early-onset NAION was increased IOP, which persisted for 30 minutes during the operation.

Hayreh and Zimmerman (27) performed a nonrandomized, open-label study of systemic corticosteroids for acute NAION and reported that corticosteroids were effective in improving visual function compared with the natural history. Despite that, a subsequent study by Rebolleda et al. (28) revealed no difference in visual outcome with corticosteroid treatment. Although there are up-to-date case series that show successful results for anti-vascular endothelial growth factor (VEGF) agents, the number of patients in these series is low and long-term follow-up is limited (29,30). In addition, NAION occurrence after intravitreal anti-VEGF injection has been reported as a complication (31). Although there is no consensus on treatment, steroid treatment is the most applied treatment in NAON treatment in current practice (5). We discussed with the patient and explained him about the risks and benefits, and performed corticosteroid treatment. After steroid treatment, the patient's visual acuity increased and there was no side effect due to steroid. Optic nerve sheath fenestration (32) and hyperbaric oxygen treatment (33) have been reported in the literature for NAION but these treatment modalities did not show beneficial effect on visual outcome.

Patients who used aspirin for the first two years after developing NAION in one eye were reported to have lower risk of developing NAION when compared with patients who have not used aspirin after developing NAION in one eye (34).

Conclusion

We propose that there are three risk factors associated with NAION: increased ocular pressure during the perioperative period, a crowded optic nerve head with a small cup-disk ratio, and diagnosis of rheumatoid arthritis. Therefore, the perioperative and postoperative ocular pressure must be attentively managed in patients with risk factors of NAION in order to prevent NAION. We suggest that cataract surgeons keep these risks factors in mind and perform simple lowering IOP maneuvers, as described on this case, to prevent unexpected vision threatening complications such as NAION.

Ethics

Informed Consent: It was taken.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: S.E.B., N.S. Concept: S.E.B. Design: S.E.B. Data Collection or Processing: S.E.B. Analysis or Interpretation: S.E.B., N.S., D.Y.E., M.E. Literature Search: S.E.B. Writing: S.E.B.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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