



# Results of Dominant and Non-dominant Hand Phacoemulsification

## *Dominant ve Dominant-olmayan El ile Fakoemülsifikasyon (Katarakt Cerrahisi) Sonuçları*

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Mustafa Kemal University Faculty of Medicine, Department of Ophtalmology, Hatay, Turkey

\*Private Medicine Hospital, Clinic of Ophtalmology, İstanbul, Turkey

\*\*Gaziosmanpaşa Taksim Training and Research Hospital, Clinic of Ophtalmology, İstanbul, Turkey

\*\*\*Haseki Training and Research Hospital, Clinic of Ophtalmology, İstanbul, Turkey

### Abstract

**Aim:** The aim was to present the outcomes of phacoemulsification surgery with dominant and non-dominant hands.

**Methods:** Eighty eyes of 72 patients undergoing phacoemulsification with a temporal clear corneal incision were included in the study by reviewing their medical records and were divided into two groups. Forty of operated eyes were right eyes and forty were left ones. We operated right eyes with dominant (right) hand, and left eyes with non-dominant (left) hand through a temporal clear corneal tunnel. The patients were followed up at week 1<sup>st</sup> and month 1<sup>st</sup> and 3<sup>rd</sup>. Keratometry and specular microscopy were performed preoperatively, at month 1<sup>st</sup> and 3<sup>rd</sup> after surgery. We recorded the total volume of fluid used, phaco time and cumulative dissipated energy. We calculated surgically-induced astigmatism using vector analysis.

**Results:** There was no statistically significant difference in intraoperative and postoperative outcomes between phacoemulsification surgeries performed with dominant and non-dominant hands.

**Conclusion:** Phacoemulsification surgeries can be carried out with non-dominant hand and with excellent outcomes.

**Keywords:** Phacoemulsification, non-dominant hand surgery, dominant hand surgery

### Öz

**Amaç:** Sağ ve sol el ile yapılan fakoemülsifikasyon sonuçlarımızı sunmaktır.

**Yöntemler:** Kliniğimizde temporal korneal insizyonla katarakt operasyonu olan 72 hastanın 80 gözü dahil edilmiştir. Kırk göz sağ el ile, 40 göz sol el ile opere edilmiştir. Hastaların 1 hafta, 1 ay ve 3 ay sonra takipleri yapılmıştır. Hastalar 1. ve 3. ay kontrollerinde keratometri ve speküler mikroskopi ile değerlendirilmiştir. Fakoemülsifikasyon zamanı, kümülatif kullanılan enerji, total kullanılan sıvı kaydedilmiştir. Cerrahi ile indüklenen astigmatizma vektör analizi kullanılarak karşılaştırılmıştır.

**Bulgular:** Sağ ve sol el ile yapılan fakoemülsifikasyonlarda; intra ve postoperatif sonuçlar istatistiksel farklılık göstermemiştir.

**Sonuç:** Fakoemülsifikasyon; dominant-olmayan el ile de yapıldığı zaman iyi sonuçlar çıkabilir.

**Anahtar Sözcükler:** Fakoemülsifikasyon, dominant olmayan el cerrahisi, dominant el cerrahisi

## Introduction

Many cataract surgeons perform phacoemulsification with temporal incision procedure (1). Surgeons usually sit at the patient's side; this requires repositioning of the surgeon's chair and surgical instruments and might increase the risk of breaches of sterility in the operating room. The surgeon can not rest his/her operating hand while performing surgery at the temporal side of the patient (2). To avoid these disadvantages, it can be better to learn how to perform surgery with dominant or non-dominant hand at the temporal side according to the eye to be operated. We studied the surgical outcomes of phacoemulsification with dominant and non-dominant hand and compared the results.

## Methods

In this retrospective comparative study, we evaluated the results phacoemulsification in eighty eyes of 72 patients with age-related cataract performed between February and June 2013. Our study was planned in accordance with the principles of the Helsinki Declaration and written informed consent was obtained from all patients. Patients with grade 2-3 cataract according to the lens opacities classification system III were included in the study. We excluded patients with corneal disorders, such as severe dry eye and corneal haze, astigmatism greater than 2.5 diopters (D), insufficient visualization of the posterior segment, intraocular lens (IOL) power lower than 10.0 D or higher than 30.0D, fellow eye with surgical complications, and inadequate follow-up. We also excluded those with proliferative diabetic retinopathy, end-stage glaucoma, active intraocular inflammation, uveitis history and retinal detachment.

## Surgical Techniques

All operations were carried out by the same surgeon. All patients were operated through temporal clear corneal incision with the surgeon sitting at the patient's head side. The surgeon used surgical equipments for the right eye with his dominant right hand and for the left eye with his non-dominant left hand as the surgeon was right-handed. Forty eyes were right eyes and forty were left ones. The surgeon used the right (dominant) hand for the right eyes, and the left (non-dominant) hand for the left eyes.

Topical tropicamide was applied for dilating the eye before surgery. A mixture of a 50:50 solution of 2% lidocaine and 0.5% bupivacaine was used through local peribulbar anesthesia. We used the Infiniti vision system with the Ozil IP platform for phacoemulsification. We set the infusion bottle height between 80 and 100 cm, aspiration flow rate to 30-40 mL/min and vacuum level to 300-400 mmHg. We operated all cases through clear corneal incision at temporal horizontal meridian. The

nucleus was emulsified by using the divide-and-conquer technique. All eyes were implanted with an Acryva hydrophobic coated intraocular lens. This was followed by injection of cefuroxime axetil into the anterior chamber. Topical therapy after surgeries included ofloxacin and dexamethasone drops 4 times per day.

## Statistical Analysis

The patients were followed up at week 1<sup>st</sup>, and month 1<sup>st</sup> and 3<sup>rd</sup>. Keratometry and specular microscopy was performed preoperatively, and at month 1<sup>st</sup> and month 3<sup>rd</sup> postoperatively. Phaco time, cumulative dissipated energy certified diabetes educator and total balanced salt solution volume used were recorded intraoperatively. We calculated surgically induced astigmatism (SIA) with vector analysis. Endothelial cell loss was evaluated at month 1<sup>st</sup> and 3<sup>rd</sup>. Student's t-test and the Mann-Whitney U test were used for statistical analysis. (SPSS v.20.0)

## Results

All eyes were operated successfully and with no intraoperative complication. Phacoemulsification time, CDE and total fluid used were comparable between the two groups ( $p>0.275$ ,  $p>0.762$  and  $p>0.438$ , respectively) (Table 1).

The mean SIA with dominant and non-dominant hand at month 1<sup>st</sup> and 3<sup>rd</sup> was 0.58 and 0.36, respectively and 0.63 and 0.40, respectively ( $p>0.996$  at month 1<sup>st</sup>,  $p>0.919$  at month 3<sup>rd</sup>) (Table 1).

Endothelial cell loss with dominant hand was 429.3 and 493.3 at month 1<sup>st</sup> and 3<sup>rd</sup>, respectively. Endothelial cell loss with non-dominant hand was 328.6 and 347.4 at month 1<sup>st</sup> and 3<sup>rd</sup>, respectively. Although endothelial cell loss count with non-dominant hand was less than that with dominant hand, the difference was not statistically significant ( $p>0.203$  at month 1<sup>st</sup>,  $p>0.054$  at month 3<sup>rd</sup>) (Table 1).

	Side		p
	Right (dominant)	Left (non-dominant)	
	Mean ± SD	Mean ± SD	
<b>US total time</b>	1.6±0.8	1.6±0.8	0.275
<b>CDE</b>	18.9±10.6	16.9±8.0	0.762
<b>Fluid used</b>	98.5±37.4	89.5±23.0	0.438
<b>SIA 1<sup>st</sup> month</b>	0.5±0.3	0.6±0.4	0.996
<b>SIA 3<sup>rd</sup> month</b>	0.3±0.2	0.3±0.3	0.919
<b>ECL 1<sup>st</sup> month</b>	429.3±393.6	328.6±304.9	0.203
<b>ECL 3<sup>rd</sup> month</b>	493.3±373.7	347.4±289.6	0.054

US: Ultrasound; CDE: Cumulative dissipated ultrasound energy, SIA: Surgically-induced astigmatism, ECL: Endothelial cell loss, SD: Standard deviation

We did not observe any statistically significant difference between intraoperative and postoperative outcomes.

### Discussion

Recently, maintaining astigmatically neutral eyes postoperatively has been aimed by the surgeons. It has been shown that a temporal approach was more stable and provoked less SIA (3). Kohnen et al. (4) reported that the difference in SIA between eyes receiving temporal incision and nasal incision was found to be statistically significant in the early postoperative period. Nasal incision which is closer to the center of the cornea compared with temporal incision has much impact on corneal refractive parameters.

Vajpayee et al. (5) reported the analysis of the results of surgery performed dominant versus non-dominant hand, by ophthalmology trainees, found no statistically difference of incidence of intraoperative complications and visual outcomes between two sides. They also reported that the overall rate of complications was lower in non-dominant hand (14.5%) compared to dominant hand operated eyes (19.7%). The explanation was that the ultrasound handpiece held in the non-dominant hand is kept as a passive instrument in the central part of the capsular bag and the chopper is the active instrument used for manoeuvring inside the bag, so the anterior chamber is held with the dominant hand. This helps to reduce the use of ultrasound energy for nuclear management, as the chopper is the primary instrument used for the mechanical disintegration of the nucleus (5). Kim et al. (6) compared the incidence of intraoperative complications during cataract surgery performed by left-handed and right-handed residents. They reported that the incidence of posterior capsule tear and vitreous loss was significantly higher in surgeries performed by right-handed residents than those performed by left-handed residents. They postulated several reasons for these findings. First, left-handed surgeons (forced to develop ambidexterity in a right-handed surgical environment) may be able to use their non-dominant hand more effectively when required to use a secondary instrument or manage intraoperative complications. Left-handed surgeons may also be more adaptable to situations in which positional orientation causes operative difficulties, as in patients with a prominent nasal bridge or cheek. Second, left-handed surgeons may be more talented. Left-handed individuals are considered to be more intellectual and artistic (7,8).

Sharma et al. (2) showed that they have found no difference between dominant and non-dominant hand surgery outcomes. Poole (9) reported that operating from

the top with the non-dominant hand in the temporal position does not give a comfortable operating position to the surgeon. To avoid moving equipment around between cases, they recommend to book only right eyes on one operating list, and left eyes on another.

Park et al. (10) demonstrated that simulated microsurgery with non-dominant hand was less efficient, less safe, and slower than simulated microsurgery with the dominant hand.

### Study Limitations

The limitations of this study were that participants who completed the program were physicians with no previous ophthalmic microsurgical experience and it is uncertain to what extent observations in a simulated environment can be transferred to a real operating room. The other limitations of our study were its retrospective design and small sample size.

### Conclusion

We did not observe any intraoperative complication in our study. Clear corneal non-dominant hand phacoemulsification is as safe and effective procedure as dominant hand phacoemulsification. Learning to perform surgery with both hands brings advantages in conditions when surgeons can not shift the position or perform surgery on the different axis for less astigmatism.

The results of our study imply the fact that performing in cataract surgery with non-dominant hand may enhance surgical performance, when measured by postoperative surgical outcomes. In the future, further research is needed to analyze the effects of non-dominant hand phaco training.

### Authorship Contributions

Concept: S.C.Ö., N.S. Design: B.K. Data Collection or Processing: Z.T., B.K., S.C.Ö. Analysis or Interpretation: N.S., F.Ö., S.C.Ö. Literature Search: S.C.Ö. Writing: S.C.Ö.

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