ORIGINAL RESEARCH ORİJİNAL ARAŞTIRMA

DOI: 10.5336/ophthal.2024-102707

# The Effect of Sedation in Addition to Local Anesthesia on the Success Rate of Muller Muscle Conjunctival Resection: Retrospective Clinical Study

## Lokal Anestezi ile Birlikte Sedasyon Uygulamasının Müller Kası Konjonktival Rezeksiyonunun Başarı Oranına Etkisi: Retrospektif Klinik Çalışma

İbrahim ÖZDEMİR[a], İrfan Botan GÜNEŞ[b]

[a]Biruni University Faculty of Medicine, Department of Ophthalmology, İstanbul, Türkiye
[b]Kocaeli Health and Technology University Medicalpark Kocaeli Hospital, Department of Ophthalmology, Kocaeli, Türkiye

**ABSTRACT Objective:** To evaluate the effect of sedative anesthesia applied during Muller muscle conjunctival resection (MMCR) on the success rate of the surgery. **Material and Methods:** Data from 41 eyes of 41 patients who underwent MMCR due to mild ptosis between October 2017 and December 2022 were examined retrospectively. The data obtained from 21 patients who received subconjunctival local anesthesia without epinephrine and intravenous midazolam (Group 1) were compared with the data of 20 patients who received only subconjunctival local anesthesia without epinephrine (Group 2). Margin reflex distance 1 (MRD1)>2.5 mm and MRD1<0.5 mm between the two eyes were accepted as success criteria after MMCR. **Results:** No significant difference was observed between the groups in terms of gender and age distribution (p=0.828 and p=0.961, respectively). Postoperatively, the mean MRD1 in the ptotic eye and the mean MRD1 difference between the two eyes were 4.2±0.2 and 0.4±0.08, respectively, in Group 1 and 4.0±0.1 ve 0.5±0.08 respectively, in Group 2. While MRD1 was found to be significantly higher in Group 1 (p=0.004), the MRD1 difference was significantly higher in Group 2 than Group 1 (p=0.017). The success rate was 95% in Group 1 and 81% in Group 2. **Conclusion:** We found that the success rate of the MMCR was higher in the group with sedation combined with local anesthetic without epinephrine. We believe that sedation increases patient comfort and surgical success, especially in Muller muscle surgeries where local anesthetics without epinephrine are preferred.

**Keywords:** Ptosis surgery; Muller muscle; sedation; local anesthesia

**ÖZET Amaç:** Müller kası konjonktival rezeksiyonu (MKKR) sırasında uygulanan, sedatif anestezinin operasyonun başarı oranına etkisini değerlendirmek. **Gereç ve Yöntemler:** Ekim 2017 ve Aralık 2022 yılları arasında hafif derecede pitozis nedeni ile MKKR uygulanan 41 hastanın, 41 gözüne ait veriler geriye dönük incelendi. Epinefrin içermeyen, subkonjonktival lokal anestezi ve intravenöz midazolam uygulanan 21 hastanın (Grup 1) verileri ile sadece subkonjonktival epinefrinsiz lokal anestezi uygulanan 20 hastanın (Grup 2) verileri karşılaştırıldı. MKKR sonrası, marjin refleks mesafesi 1 (MRM1)>2,5 mm olması ve iki göz arasında MRM1 farkının <0,5 mm olması başarı kriteri olarak kabul edildi. **Bulgular:** Gruplar arasında cinsiyet ve yaş dağılımı açısından anlamlı farklılık izlenmedi (sırasıyla p=0,828 ve p=0,961). Operasyon sonrası pitotik gözde ortalama MRM1 ve iki göz arasında ortalama MRM1 farkı Grup 1 de sırasıyla 4,2±0,2 ve 0,4±0,08 iken Grup 2 de sırasıyla 4,0±0,1 ve 0,5±0,08 idi. MRM1 Grup 1 de anlamlı düzeyde yüksek saptanırken (p=0,004) MRM1 farkı Grup 2 de Grup 1 den anlamlı düzeyde yüksek saptandı (p=0,017). Başarı oranı Grup 1 de %95, Grup 2 de ise %81 olarak saptandı. **Sonuç:** Epinefrin içermeyen lokal anestezik ile birlikte sedasyon uygulanan grupta, MKKR operasyonun başarı oranının daha yüksek olduğunu saptadık. Özellikle epinefrinsiz lokal anestezik tercih edilecek olan Müller kası cerrahilerinde sedatif anestezinin hasta konforunu ve operasyon başarısını arttırdığını düşünüyoruz.

**Anahtar Kelimeler:** Pitozis cerrahisi; Müller kası; sedasyon; lokal anestezi

**TO CITE THIS ARTICLE:**
Özdemir İ, Güneş İB. The effect of sedation in addition to local anesthesia on the success rate of muller muscle conjunctival resection: Retrospective clinical study. Turkiye Klinikleri J Ophthalmol. 2024;33(3):171-6.

**Correspondence:** İrfan Botan GÜNEŞ
Kocaeli Health and Technology University Medicalpark Kocaeli Hospital, Department of Ophthalmology, Kocaeli, Türkiye
**E-mail:** irfanoft@gmail.com

Peer review under responsibility of Turkiye Klinikleri Journal of Ophthalmology.

***Received:*** 12 Mar 2024 ***Accepted:*** 15 Apr 2024 ***Available online:*** 07 May 2024

Muller muscle conjunctival resection (MMCR) surgery has been frequently practiced among the oculoplastic surgeons for blepharoptosis since it was introduced by Putterman and Urist in 1975.[1] It can be safely applied to nearly almost all the blepharoptosis cases with acceptable levator function except the patients having ocular scarring and shortened fornices.[2,3] Although it is considered as an effective surgery in terms of increasing the margin reflex distance 1 (MRD1) sufficiently and providing symmetry between two eyelids, concerns were raised about the overall success of the surgery.[3-5] Furthermore, our understanding of the factors influencing the success of MMCR remains incomplete. The type of anesthesia to be preferred in MMCR and the content of the anesthetic substance is an important factor that will affect the success of MMCR as well as the comfort of the patient and surgeon.[6] Many local anesthetics used today contain epinephrine. Although epinephrine reduces bleeding and facilitates pain control, it makes surgical interventions for Muller muscle tissue and per-operative resection calculations difficult due to sympathetic activation.[7-9] For this reason, many oculoplastic surgeons avoid the use of local anesthetics containing epinephrine in MMCR surgery, which makes pain control difficult and shortens the duration of anesthesia.[7,9,10] For the reasons mentioned above, we think that sedation with epinephrine-free local anesthesia is a good choice for a successful operation.

In our clinical practice, we commonly noticed that there was a distinguishable discrepancy between the results of the MMCR surgery in patients who were administered sedation anesthesia plus local subconjunctival anesthesia and only local subconjunctival anesthesia. As there were no traceable literature on this matter, we aimed to evaluate effect of the sedation on the surgical outcomes of MMCR.

## MATERIAL AND METHODS

This retrospective clinical study was conducted in accordance with the principles of the Declaration of Helsinki, as amended in 2008, with the approval of the Kocaeli Health and Technology University Clinical Practices Ethics Committee (date: 29 February 2024; no: 2024-71). Informed consent was obtained from all participants. were included in the study.

This study evaluated data of 41 eyes of 41 patients with mild ptosis whose upper eyelids responded five minutes after instillation of 2.5% phenylephrine and underwent MMCR surgery. Mild ptosis was described as either demonstrating an MRD1 ≤2.5 mm in ptotic eye or MRD1 ≥1 mm lower than the MRD1 of the contralateral eyelid and levator muscle function ≥8 mm. Medical records of all patients who underwent MMCR surgery at Sakarya Yenikent State Hospital for mild ptosis between October 2017 and December 2022 were reviewed.

Patients over 18 years of age who underwent MMCR surgery for mild ptosis and completed six-month follow-up were included in the study. Patients under 18 years of age, those with a history of previous MMCR or any ocular surgery; those with dry eye disease, strabismus, glaucoma, atopic conjunctivitis; patients with congenital ptosis, third or seventh cranial nerve palsy and myasthenia graves were excluded.

All patients underwent a detailed ophthalmologic examination including measurement of MRD1 and levator muscle function. MRD1 was measured at pre-operative and six months after surgery using a digital platform. All patients were photographed by the same ophthalmologist using a Canon M50 camera (Canon, Kanagawa, Japan) in the same room, under the same lighting conditions, from a distance of 50-70 cm (Figure 1). The MRD1 measurements were taken using Canon EOS Utility software by the same ophthalmologist (İ.B.G), who was unaware of the type of anesthesia administered to each patient.

MMCR surgeries were performed by same oculoplastic surgeon (İ.Ö.) using the technique without frontal nerve block originally described by Putterman and Urist.[1] Heart rhythm, blood pressure and oxygen saturation were monitored in all patients intraoperatively. In the interviews held a week before the surgery, patients who stated that they wanted sedation due to anxiety were administered intravenous midozalam during the operation. Sedation was administered by the anesthesiologist, and 0.5 mg/kg of intravenous midazolam was injected for sedation. Local anesthesia applied to both groups was 100 mg Lidocaine hydrochloride per 1 mL and without epi-

**FIGURE 1:** Image of patient before and after Muller muscle conjunctival resection.

nephrine. Patients received 2 mL subconjunctival lidocaine injection during the operation.

The success of the surgery was determined based on both MRD1 and symmetry. Patients who achieved MRD1≥2.5 mm after surgery were defined as MRD1 success, while success in eyelid symmetry was defined as patients who achieved MRD1 ≤0.5 mm difference between the two eyelids after surgery. The patients were divided into two groups based on the type of anesthesia. Group 1 consisted of patients who received both sedation and local anesthesia, while Group 2 was comprised of those who received only local anesthesia. Surgical success was then compared between the two groups.

Statistical analysis of the data was performed using Statistical Package for the Social Sciences (SPSS Inc. Chigaco, IL) for Windows version 15.0 (Microsoft Redmond, Washington, ABD). The Shapiro-Wilk test was used to assess the normal distribution of the age, pre-operative MRD1, post-operative MRD1 and the postoperative difference in MRD1 between eyes. Levene's test was used to assess variance homogeneity of the variables. Mann-Whitney U Test, chi-square Test and Independent Sample t-test were used to evaluate the significance of differences between the groups. Data were analyzed at 95% confidence level and tests were considered significant if the p<0.05.

## RESULTS

This study comprised 21 eyes of 21 patients in Group 1 and 20 eyes of 20 patients in Group 2. The mean age of patients was 31.3±7.1 years in Group 1 and 29.3±7.4 in Group 2. No significant difference was found between groups according to age (p=0.961) (Table 1).

Average pre-operative MRD1 in ptotic eyes were 1.8±0.3 mm in Group 1 and 1.9±0.3 mm in Group 2 there was a similarity in the average preoperative MRD1 measurements (p=0.942).

The post-operative mean MRD1 was significantly higher in Group 1 than Group 2 (p=0.004) (Table 2). Furthermore, the post-operative mean difference in MRD1 was 0.4±0.08 mm in Group 1 and 0.5±0.08 mm in Group 2 it was significantly lower in Group 1 compared to Group 2 (p=0.017).

During the operation, one patient in the Group 1 and four patient in the Group 2 required 1 mL reapplication of local anesthesia. Within one week after surgery significant upper eyelid edema developed in one patient (4.76%) in Group 1 and four patients (20%) in Group 2. Hematoma of the upper eyelid occurred in two patients (9.52%) in Group 1 and four patients (20%) in Group 2. All complications above resolved with conservative treatment.

**TABLE 1:** Demographic data and fallow-up period of the groups.

| | Group 1 n:21 | Group 2 n:20 | p value |
|---|---|---|---|
| Gender (F/M) | 14/6 | 13/8 | 0.828[a] |
| Age ($\bar{X}$±SD) year | 31.3±7.1 | 29.3±7.4 | 0.961[b] |
| Fallow-up period (month±SD) | 9.25±1.85 | 9.34±1.25 | 0.741[b] |
| Tissue resection amount (mm) | 8 (8-9) | 8 (8-9) | - |

Descriptive characteristics were given as $\bar{X}$±standard deviation (SD) (minimum-maximum). A p-value <0.05 was accepted as statistically significant.
Group 1: Sedation+Local anesthesia; Group 2: Local anesthesia; n: Number of cases; M/F: Males/females,; achi-square test; bIndependent t-test.

**TABLE 2:** Pre and post operative mean MRD1 values and success rate of the groups.

| | Group 1 n:21 | Group 2 n:20 | p value |
|---|---|---|---|
| Pre-op MRD1 ($\bar{X}$±SD) (mm) | 1.8±0.3 | 1.9±0.3 | 0.942[a] |
| Post-op MRD1 ($\bar{X}$±SD) (mm) | 4.2±0.2 | 4.0±0.1 | 0.004[a] |
| Post-op difference of MRD1 ($\bar{X}$±SD) (mm) | 0.4±0.08 | 0.5±0.08 | 0.017[a] |
| Success rate | 95% | 81% | 0.040[b] |

Descriptive characteristics were given as $\bar{X}$±Standard deviation (SD). A p-value <0.05 was accepted as statistically significant.
Group 1: Sedation+Local anesthesia, Group 2: Local anesthesia; n: Number of cases; MRD1: Marginal reflex distance; aIndependent t-test; bchi-square test.

## DISCUSSION

Today, many local anesthetic agents contains epinephrine together with lidocaine because of its bleeding-reducing effect and its contribution to pain control.[7,9] In surgical interventions performed with local anesthetics that do not contain epinephrine, bleeding control becomes difficult, and a higher amount of administration is required for pain control and adequate duration.[11-13] Despite the negative aspects of epinephrine-free local anesthetic agents, many oculoplastic surgeons do not use epinephrine-containing local anesthetic agents in MMCR surgery to avoid the shortening effect of Muller muscle with adrenergic activation.[14,15] Therefore, comfortable surgery and MMCR success may increase when epinephrine-free local anesthetics are used together with sedation for patient and surgeon comfort and thus high MMCR success. In this study, we compared the success rates of MMCR performed with sedation and epinephrine-free local anesthesia and MMCR performed with epinephrine-free local anesthesia alone.

According to our study, sedation group yielded significantly more successful outcomes compared to the local anesthesia group regarding the postoperative MRD1 and symmetry results (p=0.004, p=0.017). All the parameters which could possibly affect the MMCR surgery were similar between the two groups other than the anesthesia types and all surgeries were performed by the same experienced surgeon with the same operation technique. The overall success was 95% in sedation group and 81% in local group regarding the achievement of both goals (p=0.04). Putterman and Fett, the first practitioners of the MMCR surgery, published the ten years results of the procedure and indicated that MRD1>2.5 was achieved in 82% of eyelids and 83% of eyelids were symmetrical within the 1 mm range.[16] In a large cohort study spanning 15 years and enrolling 315 eyes; the success rates were 65.7% for achieving MRD1>2.5 mm and 82.9% for achieving symmetry within 1 mm.[4] While our success rates in sedation group were better than literature, those in local anesthesia group were similar to the studies above. It should not be forgotten that our number of patients is much less than in the studies above.

Even though MMCR is a safe and efficacious treatment, the exact mechanisms that take part in elevating the eyelid and the factors that determine the success of the surgery remain controversial. In a study comparing the standard 7 mm Muller resection and variable 4:1 ratio resection, the surgical results were found to be similar.[17] The authors suggested that there could be factors other than the mechanical factors which might influence the surgical outcome. In another study, only preoperative MRD1 and female sex were suggested as the predictors of success in MMCR surgery.[4] Additionally, anesthesia regimen was not evaluated in this study. In our study, preoperative MRD1 and gender distribution were similar in both groups (p=0.942, p=0.828).

Choice of the appropriate anesthesia for MMCR is also a question of debate. Zatezalo et al. conducted a prospective comparative study for analyzing pain and surgical outcomes between frontal nerve blocks and subconjunctival anesthesia in MMCR and found no difference between the two procedures. They indicated that although the frontal nerve block is a valid technique, they prefer the subconjunctival anesthesia because; it is safer compared to frontal nerve block,

it has favorable outcomes, it provides sufficient pain control (no intravenous sedation is needed) and finally it induces less hemorrhage in the tissues via vasoconstriction.[18] However, there are some concerns about the standardization of the anesthesia because, they also administered intravenous sedation to the patients to enhance the compliance to the local anesthesia.

Another topic which is worthy of discussion is the usage of epinephrine in subconjunctival anesthesia for MMCR. Some clinicians recommended the avoidance of epinephrine due to its contraction effect on Muller's muscle thereby making the adjusting of tissue resection difficult.[19,20] Matsuda et al. demonstrated that epinephrine increased the eyelid intraoperatively leading to the eyelid drop postoperatively.[9] However, they didn't refer to the success of the surgery in detail. On the other hand, Mohammad and Hussain indicated that subconjunctival anesthesia with epinephrine yielded more successful outcomes compared to the subconjunctival anesthesia without epinephrine in MMCR surgery.[6] In our study, both groups were administered same amount of local anesthesia without epinephrine. We demonstrated that intravenous sedation plus subconjunctival anesthesia without epinephrine for MMCR had favorable outcomes compared to subconjunctival anesthesia without epinephrine alone. Operation anxiety might induce sympathetic activity. Increased sympathetic activity causes an increase in blood pressure and pulse rate during the operation and increases bleeding and makes bleeding control difficult. This may be the reason why we encountered more postoperative eyelid edema and hematoma in the local anesthesia group. This enhanced sympathetic activity might have also contracted the Muller's muscle and impaired the proper adjustment of the intended tissue resection. Additionally increased sympathetic activity might have caused the contraction of all the eyelid, possibly may cause measurement errors. We think that intravenous sedation might counterbalance all the adverse conditions aforementioned above. Guo et al. carried out a study which evaluated the outcomes of three anesthesia types, local anesthesia, general anesthesia, and sedative anesthesia for Muller aponeurosis composite flap advancement surgery and found that sedative anesthesia may create better MRD1 results.[21] The authors stated that patients feel more comfortable and surgeons can control the process more easily using the sedative approach.[21]

The low sample size and the fact that only MRD1 was evaluated as the success criterion of surgery are the shortcomings of our study.

## CONCLUSION

We demonstrated that sedation anesthesia with subconjunctival local anesthesia had more successful outcomes compared to subconjunctival anesthesia alone regarding achieving MRD1>2.5 mm and symmetry of the eyelids within 1 mm. Local anesthesia with sedation may be a good choice, especially for surgeons who prefer local anesthetics without epinephrine. Further prospective randomized studies with large sample size are needed to confirm this conclusion.

### *Source of Finance*

*During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.*

### *Conflict of Interest*

*No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.*

### *Authorship Contributions*

***Idea/Concept:*** *İbrahim Özdemir;* ***Design:*** *İbrahim Özdemir, İrfan Botan Güneş;* ***Control/Supervision:*** *İbrahim Özdemir;* ***Data Collection and/or Processing:*** *İbrahim Özdemir, İrfan Botan Güneş;* ***Analysis and/or Interpretation:*** *İbrahim Özdemir, İrfan Botan Güneş;* ***Literature Review:*** *İrfan Botan Güneş;* ***Writing the Article:*** *İrfan Botan Güneş;* ***Critical Review:*** *İbrahim Özdemir, İrfan Botan Güneş;* ***References and Fundings:*** *İbrahim Özdemir, İrfan Botan Güneş;* ***Materials:*** *İbrahim Özdemir, İrfan Botan Güneş.*

## REFERENCES


1. Putterman AM, Urist MJ. Müller muscle-conjunctiva resection. Technique for treatment of blepharoptosis. Arch Ophthalmol. 1975;93(8):619-23. [Crossref] [PubMed]
2. Cohen LM, Rootman DB. Blepharoptosis repair: external versus posterior approach surgery: why I select one over the other. Facial Plast Surg Clin North Am. 2021;29(2):195-208. [Crossref] [PubMed]
3. Leung VC, Dupuis JE, Ashraf DC, Idowu OO, Massicotte E, Vagefi MR, et al. Müller muscle conjunctival resection: a multicentered prospective analysis of surgical success. Ophthalmic Plast Reconstr Surg. 2023;39(3):226-31. Erratum in: Ophthalmic Plast Reconstr Surg. 2023;39(3):304. [Crossref] [PubMed]
4. Dan J, Sinha KR, Rootman DB. Predictors of success following müller's muscle-conjunctival resection. Ophthalmic Plast Reconstr Surg. 2018;34(5):483-6. [Crossref] [PubMed]
5. Rootman DB, Karlin J, Moore G, Goldberg R. The role of tissue resection length in the determination of post-operative eyelid position for Muller's muscle-conjunctival resection surgery. Orbit. 2015;34(2):92-8. [Crossref] [PubMed]
6. Mohammad S, Hussain A. Outcomes of conjunctival-Müller's muscle resection surgery with and without epinephrine in local anesthetic. Orbit. 2022;41(1):84-8. [Crossref] [PubMed]
7. Bartley GB, Lowry JC, Hodge DO. Results of levator-advancement blepharoptosis repair using a standard protocol: effect of epinephrine-induced eyelid position change. Trans Am Ophthalmol Soc. 1996;94:165-73; discussion 174-7. [PubMed] [PMC]
8. Sajja K, Putterman AM. Müller's muscle conjunctival resection ptosis repair in the aesthetic patient. Saudi J Ophthalmol. 2011;25(1):51-60. [Crossref] [PubMed] [PMC]
9. Matsuda H, Kabata Y, Takahashi Y, Hanzawa Y, Nakano T. Influence of epinephrine contained in local anesthetics on upper eyelid height in transconjunctival blepharoptosis surgery. Graefes Arch Clin Exp Ophthalmol. 2020;258(6):1287-92. [Crossref] [PubMed]
10. Lake S, Mohammad-Ali FH, Khooshabeh R. Open sky müller's muscle-conjunctiva resection for ptosis surgery. Eye (Lond). 2003;17(9):1008-12. [Crossref] [PubMed]
11. Waqar S, McMurray C, Madge SN. Transcutaneous blepharoptosis surgery-advancement of levator aponeurosis. Open Ophthalmol J. 2010;4:76-80. [Crossref] [PubMed] [PMC]
12. Yanagidate F, Strichartz GR. Local anesthetics. Handb Exp Pharmacol. 2007;(177):95-127. [Crossref] [PubMed]
13. Neal JM. Effects of epinephrine in local anesthetics on the central and peripheral nervous systems: neurotoxicity and neural blood flow. Reg Anesth Pain Med. 2003;28(2):124-34. [Crossref] [PubMed]
14. Strosberg AD. Structure, function, and regulation of adrenergic receptors. Protein Sci. 1993;2(8):1198-209. [Crossref] [PubMed] [PMC]
15. Esmaeli-Gutstein B, Hewlett BR, Pashby RC, Oestreicher J, Harvey JT. Distribution of adrenergic receptor subtypes in the retractor muscles of the upper eyelid. Ophthalmic Plast Reconstr Surg. 1999;15(2):92-9. [Crossref] [PubMed]
16. Putterman AM, Fett DR. Müller's muscle in the treatment of upper eyelid ptosis: a ten-year study. Ophthalmic Surg. 1986;17(6):354-60. [Crossref] [PubMed]
17. Rootman DB, Sinha KR, Goldberg RA. Change in eyelid position following muller's muscle conjunctival resection with a standard versus variable resection length. Ophthalmic Plast Reconstr Surg. 2018;34(4):355-60. [Crossref] [PubMed]
18. Zatezalo CC, Tavakoli M, Ayala-Haedo J, Callaway NF, Ko MJ, Anagnostopoulos AG, et al. A prospective randomized comparative clinical trial to analyze pain and surgical outcomes between frontal nerve blocks and subconjunctival anesthesia for conjunctival mullerectomy resection. Ophthalmic Plast Reconstr Surg. 2018;34(6):575-8. [Crossref] [PubMed]
19. Han HH, Kim MS. Transconjunctival müller's muscle tucking method for non-incisional correction of mild ptosis: the effectiveness and maintenance. Aesthetic Plast Surg. 2019;43(4):938-45. [Crossref] [PubMed]
20. El-Saadani, Mandour SS, Ramadan AE. Müller's muscle-conjunctival resection for blepharoptosis repair. Menoufia Med J. 2015;28:954-9. [Crossref]
21. Guo Z, Park DDH, Park K, Guo N. Three different anesthesia approaches in blepharoptosis surgery. Plast Reconstr Surg Glob Open. 2019;7(4):e2136. [Crossref] [PubMed] [PMC]