Published in final edited form as:

Orbit. 2015 April ; 34(2): 79–83. doi:10.3109/01676830.2014.999287.

The significance of minimal adjustments in the muller's muscle and conjunctiva resection procedure to achieve the phenylephrine result

Rakesh M Patel, M.D.¹, Alice Z Chuang, Ph.D.², Juliana Sartori, M.D.¹, Vinay K Aakalu, M.D.¹, Allen M Putterman, M.D.¹, and Pete Setabutr, M.D.¹

¹ Department of Ophthalmology and Visual Sciences, University of Illinois at Chicago, Chicago, Illinois, USA.

² Ruiz Department of Ophthalmology and Visual Science, The University of Texas Medical School at Houston, Houston, Texas, USA.

Abstract

Purpose—To determine if adjusting the resection amount within a small range has a significant difference in the amount of lift achieved when performing the muller's muscle and conjunctiva resection procedure (MMCR).

Methods—A retrospective chart review was performed analyzing 102 eyelids of 68 patients with involutional blepharoptosis that had a MMCR resection amount ranging from 8.0-9.5mm performed by a single surgeon (P.S.)

Results—The average lift for all resections was 2.30mm. When comparing amongst all resection groups, there was no significant difference in the amount of lift obtained ($p=0.2454$).

Conclusion—When performing the MMCR procedure, adjusting the resection amount within a small range of 8.0-9.5mm does not affect the amount of lift achieved.

Introduction

Blepharoptosis is a commonly encountered condition in an oculoplastic practice. Various etiologies may be responsible for ptosis with levator dehiscence being the most common cause.¹ Numerous techniques have been described to treat involutional ptosis with the two most commonly utilized methods being muller's muscle and conjunctiva resection (MMCR) or external levator advancement.² At our institution, the preferred method of treatment has been MMCR.

CORRESPONDING AUTHORS: Rakesh M Patel M.D., 1855 West Taylor Street, Chicago, Illinois 60612; xrakesh33@gmail.com; ph: 312-996-9120; fax: 312-413-7895.

PROPRIETARY INTEREST STATEMENT:

The authors report no conflicting financial interests.

HIPAA STATEMENT:

The case report is in compliance with the Health Insurance Portability and Accountability Act.

The Fasanella-Servat procedure was described in 1961 as a posterior approach to treat mild ptosis that possessed good levator function.³ Putterman and Urist subsequently described the MMCR procedure for mild ptosis with good levator function that responds to 10% phenylephrine.⁴ Several modifications to the surgical technique have since been described in the literature.⁵⁻⁷

There has been great interest in defining an algorithm for the amount of tissue resection required to achieve the desired final eyelid height.⁶⁻¹⁸ Putterman suggested resecting 8.25mm of conjunctiva and muller's muscle to achieve the eyelid height induced by phenylephrine.¹⁴ The resection amount is then increased or decreased depending on whether phenylephrine undercorrected or overcorrected the desired lid level.

Weinstein and Buerger reported 71% of patients achieved the phenylephrine result with a 8mm resection of conjunctiva and muller's muscle. In addition, they hypothesized that if a linear relationship between the amount of muller's muscle resected and the eyelid height does exist, increasing or decreasing the resection by 1mm will change the post-operative eyelid height by 0.25mm.¹¹ Dresner's algorithm required the eyelid height to increase by 2mm or more with 10% phenylephrine. In patients with such a response, 4mm MMCR was performed for 1mm of ptosis, 6mm MMCR for 1.5mm of ptosis, 8mm for 2mm of ptosis, and 10mm MMCR for 3mm of ptosis.⁶ Perry et al described resecting 9mm of conjunctiva and muller's muscle + x where x equals the millimeter amount of tarsus to resect for every millimeter of undercorrection after phenylephrine testing.¹⁰ Ben Simon et al used an algorithm similar to Dresner's but did not find a strong linear relationship between the extent of MMCR and ptosis correction. Although they concluded the phenylephrine testing underestimated the final post-operative correction, it is notable that the average response to phenylephrine was 0.7mm $\pm$ 1mm, less than the 2mm that is typically considered optimal.¹²

Given the various reports of utilizing differing "standard" resections to achieve the phenylephrine result as well as one of the authors (P.S.) own clinical experience, we hypothesized that small incremental changes in resection amount is insignificant to the amount of lift achieved. We therefore studied patients who had a MMCR resection of 8.0-9.5mm to see if the magnitude of the lift differed among the resection groups.

Methods

This is a retrospective chart review of all patients who had a MMCR performed by a single surgeon (P.S.) from January 2008 until December 2012 for treatment of ptosis. Exclusion criteria includes history of enucleation, keratoprosthesis surgery, or levator function less than 10mm. In addition, patients with insufficient data recorded are excluded as well. Only patients with a MMCR amount of 8.0-9.5mm are included as majority of patients receive this resection amount at our institution. Institutional review board approval was obtained prior to initiation of this study.

Recorded data includes patient demographics (age, gender, and race), study eye, pre-operative margin to reflex distance-1 (MRD1) with and without 2.5% phenylephrine,

resection amount, post-operative MRD1, the change in MRD1 and average post-operative follow-up.

Data were summarized by mean (SD) for continuous variables (i.e. age and MRD1) and frequency (%) for discrete variables (i.e. race). The differences of postoperative MRD1 from preoperative MRD1 with and without phenylephrine test were calculated and compared within each resection amount using paired test. Comparing preoperative MRD1 and the change of MRD1 pre- and post-operation among 3 different resection amounts was conducted using mixed effect model. All statistical analyses were performed using SAS for Windows 9.3 (SAS Institute Inc., Cary, NC, USA). A P-value <0.05 was considered statistically significant.

Pre-operatively, all blepharoptosis patients received several drops of 2.5% phenylephrine instilled into the superior fornix of the ptotic eyelid with the patient in the recumbent position. The MRD1 was measured before and five minutes after instillation of the drop. The drop was placed into both eyes if the patient had bilateral ptosis. In unilaterally ptotic patients, the drop was only placed in the ptotic eyelid. If this maneuver revealed contralateral ptosis, a drop was then placed into the contralateral eyelid with the MRD1 re-measured for both eyelids. The final MRD1 measured bilaterally was then used to help guide the resection amount for each eyelid.

The resection amount chosen was based on the adequacy of the phenylephrine response. If the MRD1 with phenylephrine was deemed adequate, 8.5mm of tissue was resected. If phenylephrine overcorrected or undercorrected the eyelid, slightly more or slightly less tissue was chosen for resection.

After informed consent was obtained, MMCR was performed utilizing a technique similar to the one described by Dresner.⁶ The procedure was typically performed under monitored anesthesia care unless the patient requested general anesthesia. The upper eyelid was infiltrated with ~0.5ml of 1% lidocaine with 1:100,000 epinephrine subcutaneously along the eyelid crease and near the lid margin. Care was taken to ensure minimal local anesthesia was utilized to prevent distortion of eyelid anatomy with swelling. A 4-0 silk traction suture was placed centrally 2mm superior to the lash line. The lid was everted over a Desmarr retractor and several tetracaine drops were placed on the palpebral conjunctiva. One-half the predetermined resection amount was measured from the superior tarsal border with a caliper and marked with a 6-0 silk suture centrally and tied to itself as a traction suture. Care was taken to ensure the central suture was placed in line with the center of tarsus. Similarly, 6-0 silk marking sutures were also passed nasally and temporally. The attachments of the conjunctiva and muller's muscle were freed from levator aponeurosis with a toothed forceps. With the assistant pulling the temporal and nasal sutures and the surgeon pulling the central suture to the ceiling, the ptosis clamp was placed over the tented up tissue and locked in place taking care not to incorporate tarsus into the clamp. The silk marking sutures were removed and a double armed 6-0 plain gut suture was then passed in a running horizontal mattress fashion from temporal to nasal approximately 1.0-1.5mm below the clamp. A #15 Bard-Parker blade excised the tissue incorporated in the clamp with metal on metal contact. The nasal suture was then passed back in a running fashion from nasal to temporal

reapproximating the edges of the conjunctiva. Both arms of the suture were passed into the temporal wound and tied off with the knot buried into the wound. Antibiotic ointment was placed on the eye with instructions for the patient to follow-up in 1 week.

Results

102 eyelids of 68 patients underwent MMCR of a resection amount 8.0-9.5mm without tarsectomy by a single surgeon (P.S.) with the average age of the patient being 60 years (SD: 16; range: 23-86). 21 (31%) patients were male and 47 (69%) were female. There were 24 (24%) eyelids with 8.0mm tissue resection, 35 (34%) eyelids with 8.5mm resection, 30 (29%) eyelids with 9.0mm resection, and 13 eyelids with 9.5mm resection (13%). Average follow-up was 3.4 months.

Concurrent procedures performed at the time of ptosis repair included upper eyelid blepharoplasty in 15 patients and bilateral tarsal strips in 7 patients. Other concurrent procedures included punctoplasties and lower lid lesion removal in one patient.

The mean pre-operative MRD1, the phenylephrine response, and the final post-operative MRD1 are shown in Table 1. In addition, this is subdivided by resection amounts in Table 2. The average pre-operative MRD1 for all patients was 0.14mm (SD=1.12) and the average MRD1 after instillation of phenylephrine was 2.49mm (SD=0.87). The mean post-operative MRD1 was 2.44mm (SD=1.18). There is no significant difference in the amount of eyelid elevation obtained when placing the phenylephrine drop among the resection groups ($p=0.7258$).

When comparing various resection amounts, there was no statistically significant difference in the amount of lift obtained among the resection groups ($p=0.2454$) with the average lift being 2.30 mm (standard error = 0.36) after the MMCR procedure. Among all resection groups, the post-operative MRD1 was 0.05mm (SD=1.12) less than the results predicted by phenylephrine. This indicates the phenylephrine test is able to predict the post-operative MRD1 for all resection groups ($p=0.6664$).

Discussion

The popularity of the MMCR procedure continues to grow given the relative simplicity in performing the procedure to treat ptosis. However, the mechanism through which the operation relieves ptosis has been debated for decades. Putterman suggested it was strengthening of muller's muscle through its resection and advancement that led to the success of the MMCR procedure.¹⁹ Buckman et al reported a series of 37 patients who were treated with the Fasanella-Servat procedure. They found 87.5% of cases had absent to minimal smooth muscle yet the results were just as successful as patients with moderate to large amounts of muller's muscle concluding muller's muscle resection is not critical to the success of the procedure.²⁰ Similarly, Zauberman et al found no correlation to the net amount of muscle tissue within the specimen and final result. However, they did note a correlation between the millimeter amount of muller's muscle and conjunctiva resected and final eyelid level concluding posterior lamellar scarring or plication plays a larger role in alleviating ptosis.⁹ Marcet et al eloquently demonstrated in a cadaver study that it is the

advancement of levator as well as shortening of the posterior lamella that leads to the success of the MMCR procedure.²¹

Perry et al hypothesized that complete or nearly complete excision of muller's muscle should accomplish the same degree of eyelid elevation as phenylephrine testing.¹⁰ We concur with this statement believing too much emphasis is placed on adjusting the resection amount within such a small range to achieve an optimal result. This is clearly evident in the literature where multiple algorithms call for different “standard” resections ranging from 8.0-9.0mm to achieve the phenylephrine result.⁶⁻¹⁸ Our results support this fact as the amount of lift achieved amongst the various resection groups ranging from 8.0-9.5mm was not significantly different ($p=0.2454$). In addition, phenylephrine overestimated the postoperative result by only 0.05mm amongst all patients ($p = 0.6664$) indicating it is a good predictor of post-operative outcome. We therefore hypothesize that small incremental changes in the resection amount in our study range are insignificant to achieving the phenylephrine result.

Our study does have its limitations. For one, a longer follow-up study is necessary. In addition, prior to the development of this study, we did believe varying the resection varied the power of the lift, even for small incremental changes. Therefore, the severity of ptosis does differ among the resection groups as patients with more severe ptosis tended to have a larger resection creating a selection bias. A suggested future study may involve a prospective trial randomizing patients with the same degree of ptosis to different resection amounts within a small range.

Our study only analyzed a subset of patients with resection amounts ranging from 8.0-9.5mm. Many surgeons will perform resections as small as 4.0mm and high as 10mm if not more.⁶ In such drastically different resection amounts, there likely is a significant difference in the amount of lift achieved. This may partly be explained by the large differences in the amount of posterior lamellar shortening and levator palpebrae superioris advancement contributing to eyelid elevation, an effect that may be negligible to the overall result with small differences in the resection amount as in our study.

Conclusion

MMCR has proven to be an effective procedure in treating mild amounts of ptosis. Since its development, several algorithms have been described that have proven to be successful for the respective authors with each algorithm calling for small variations in the resection amount ranging from 8.0-9.0mm to achieve the phenylephrine result.⁶⁻¹⁸ Our results demonstrate that in fact, all suggested resections may be appropriate to achieve the phenylephrine result. Ultimately, the authors believe the lack of precision and consistency in marking the resection amount within such a small range allows all suggested “standard” resections to be accurate.

Acknowledgments

FINANCIAL SUPPORT:

Supported by an unrestricted grant from Research to Prevent Blindness, New York, NY. Dr. Vinay Aakalu is supported by NEI/NIH K12 Clinical Scientist Training Grant (5K12E4021475), Bethesda, MD. Supported by P30 – Core Grants for Vision Research (5P30EY001792 and P30EY010608).

References

1. Lim JM, Hou JH, Singa RM, et al. Relative incidence of blepharoptosis subtypes in an oculoplastics practice at a tertiary care center. *Orbit*. 2013; 32:231–4. [PubMed: 23662688]
2. Aakalu VK, Setabutr P. Current ptosis management: a national survey of ASOPRS members. *Ophthal Plast Reconstr Surg*. 2011; 27:270–6.
3. Fasanella RM, Servat J. Levator resection for minimal ptosis: another simplified operation. *Arch Ophthalmol*. 1961; 65:493–6. [PubMed: 13698293]
4. Putterman AM, Urist MJ. Mullers muscle-conjunctival resection: a method for treatment of blepharoptosis. *Arch Ophthalmol*. 1975; 92:619–623. [PubMed: 1156223]
5. Baldwin HC, Bhagey J, Khooshabeh R. Open sky muller muscle-conjunctival resection in phenylephrine test-negative blepharoptosis patients. *Ophthal Plast Reconstr Surg*. 2005; 21:276–80.
6. Dresner SC. Further modifications of the muller's muscle-conjunctival resection procedure for blepharoptosis. *Ophthal Plast Reconstr Surg*. 1991; 7:114–22.
7. Carruth BP, Meyer DR. Simplified muller's muscle-conjunctival resection internal ptosis repair. *Ophthal Plast Reconstr Surg*. 2013; 29:11–14.
8. Liu MT, Totonchi A, Katira K, et al. Outcomes of mild to moderate upper eyelid ptosis correction using muller's muscle-conjunctival resection. *Plast Reconstr Surg*. 2012; 130:799e–809e.
9. Zauberman NA, Koval T, Kinori M, et al. Muller's muscle-conjunctival resection for upper eyelid ptosis: correlation between amount of resected tissue and outcome. *Br J Ophthalmol*. 2013; 97:408–11. [PubMed: 23298887]
10. Perry JD, Kadakia A, Foster JA, et al. A new algorithm for ptosis repair using conjunctival mullerectomy with or without tarsectomy. *Ophthal Plast Reconstr Surg*. 2002; 18:426–9.
11. Weinstein GS, Buerger GF. Modifications of the muller's muscle-conjunctival resection operation for blepharoptosis. *Am J Ophthalmol*. 1982; 93:647–51. [PubMed: 7081363]
12. Ben Simon GJ, Lee S, Schwarcz RM, et al. Muller's muscle-conjunctival resection for correction of upper eyelid ptosis. *Arch Facial Plast Surg*. 2009; 413–7.
13. Putterman AM, Urist MJ. Muller muscle-conjunctiva resection: technique for treatment of blepharoptosis. *Arch Ophthalmol*. 1975; 93:619–23. [PubMed: 1156223]
14. Putterman AM, Fett DR. Muller's muscle in the treatment of upper eyelid ptosis: a ten-year study. *Ophthalmic Surg*. 1986; 17:354–60. [PubMed: 3737107]
15. Mercandetti M, Putterman AM, Cohen ME, et al. Internal levator advancement by muller's muscle-conjunctival resection technique and review. *Arch Facial Plast Surg*. 2001; 3:104–10. [PubMed: 11368662]
16. Putterman AM. Muller's muscle-conjunctival resection ptosis procedure. *Aust N Z J Ophthalmol*. 1985; 13:179–83. [PubMed: 4052266]
17. Putterman AM, Urist MJ. Muller's muscle-conjunctival resection ptosis procedure. *Ophthalmic Surg*. 1978; 9:27–32. [PubMed: 400835]
18. Shields M, Putterman A. Blepharoptosis correction. *Curr Opin Otolaryngol Head Neck Surg*. 2003; 11:261–6. [PubMed: 14515075]
19. Putterman AM. A clamp for strengthening muller's muscle in the treatment of ptosis. *Arch Ophthalmol*. 1972; 87:665–7. [PubMed: 5032737]
20. Buckman G, Jakobiec F, Hyde K, et al. Success of the fasanella-servat operation independent of muller's smooth muscle excision. *Ophthalmology*. 1989; 96:413–8. [PubMed: 2726170]
21. Marcet MM, Setabutr P, Lemke BN, et al. Surgical microanatomy of the muller muscle-conjunctival resection ptosis procedure. *Ophthal Plast Reconstr Surg*. 2010; 26:360–4.

Table 1

The mean pre-operative MRD1, MRD1 with phenylephrine, and the post-operative MRD1 are listed for all patients.

Variable	N	Mean (SD)
Pre-operative MRD1	102	0.14 (1.12)
MRD1 with phenylephrine	102	2.49 (0.87)
Post-operative MRD1	102	2.44 (1.18)

Table 2a-d

The mean pre-operative MRD1, MRD1 with phenylephrine, and the post-operative MRD1 is subdivided by resection amount

Table 2a –8mm resection		
Variable	N	Mean (SD)
Pre-operative MRD1	24	0.60 (1.05)
MRD1 with phenylephrine	24	2.83 (0.78)
Post-operative MRD1	24	2.44 (1.41)

Table 2b –8.5mm resection		
Variable	N	Mean (SD)
Pre-operative MRD1	35	0.12 (1.24)
MRD1 with phenylephrine	35	2.57 (0.82)
Post-operative MRD1	35	2.48 (0.97)

Table 2c –9.0mm resection		
Variable	N	Mean (SD)
Pre-operative MRD1	30	0.07 (0.95)
MRD1 with phenylephrine	30	2.32 (0.95)
Post-operative MRD1	30	2.60 (1.34)

Table 2d –9.5mm resection		
Variable	N	Mean (SD)
Pre-operative MRD1	13	−0.52 (1.03)
MRD1 with phenylephrine	13	2.02 (0.73)
Post-operative MRD1	13	1.98 (0.84)