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Efficacy of muller's muscle and conjunctiva resection with or without tarsectomy for the treatment of severe involutional blepharoptosis

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Abstract

Purpose—To determine if muller's muscle and conjunctiva resection (MMCR) with or without tarsectomy is an efficacious procedure for the treatment of severe involutional blepharoptosis.

Methods—A retrospective chart review was performed of all consecutive patients with severe involutional blepharoptosis during a twelve-year period treated by a single surgeon (AMP) with a MMCR with or without tarsectomy. The inclusion criteria was good levator function (≥ 10mm eyelid excursion), adequate response to phenylephrine (change in eyelid height ≥ 1.5mm) and severe involutional blepharoptosis (margin-to-reflex-distance-1 ≤ 0mm).

Results—100 eyelids of 69 patients were identified that met the inclusion criteria. Mean preoperative margin-to-reflex-distance-1 was −0.65mm and mean postoperative margin-to-reflex-distance-1 was 3.00mm for all patients. For patients treated with MMCR without tarsectomy, mean preoperative and postoperative margin-to-reflex-distance-1 was −0.51mm and 2.98mm with 97.5% of the patients obtaining a lift greater than 1.5mm.

Conclusions—Our results demonstrate that MMCR with or without tarsectomy does provide another alternative to the surgeon for the management of severe involutional blepharoptosis.

Introduction

Numerous surgical techniques have been described for the treatment of blepharoptosis. Methods to repair ptosis include frontalis slings and levator advancement with or without resection as well as posterior approaches such as Fasanella-Servat (FS) or muller's muscle and conjunctiva resection (MMCR).¹⁻²³ The applications of these aforementioned

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techniques have frequently been limited to various subsets of blepharoptosis. For example, frontalis slings are utilized for severe ptosis with poor levator function while FS and MMCR have classically been reserved for mild to moderate ptosis with good levator function.¹⁻¹⁶ Meanwhile, levator aponeurosis surgery ranging from simple levator advancement to maximal levator resection or Whitnall's slings has shown great versatility in its ability to address many forms of blepharoptosis.¹⁸⁻²³

Since the introduction of the FS procedure in 1961 and then the MMCR procedure in 1975, the acceptance of the posterior approach ptosis surgery has grown significantly.^{1,9} The simplicity of the procedure, the lack of an external scar, and the ability to maintain a natural upper eyelid contour drives its popularity. This has consequently led to great interest in developing an algorithm to determine the amount of tissue resection necessary to achieve the desired result as well as numerous anatomic studies being performed to better understand the mechanism of these procedures.^{16,24-29}

Frequently it is stated that the FS and MMCR procedures are limited to the patient with mild to moderate ptosis.^{1-6, 14-16, 25} However, the authors believe MMCR may be applicable to the severely ptotic eyelid with good levator function that is responsive to phenylephrine. This report describes the senior author's (AMP) results of performing MMCR with or without tarsectomy for the management of severe involutional blepharoptosis.

Methods

This is an institutional review board approved study by the University of Illinois at Chicago. A retrospective chart review was performed on all patients with severe involutional blepharoptosis that had a MMCR with or without tarsectomy performed by a single surgeon (AMP) from January 2000 to December 2012.

Severe blepharoptosis was defined as a margin-to-reflex-distance-1 (MRD-1) of less than or equal to 0mm. Other inclusion criteria included levator function of greater than or equal to 10mm of lid excursion, an adequate response to phenylephrine, and a follow-up period of at least 6 months. Adequate phenylephrine response was defined as a change in eyelid height (MRD-1) equal to or greater than 1.5mm. Patients with insufficient recorded data were excluded from this study.

Analyzed data included patient age, gender, preoperative MRD-1 with and without phenylephrine, postoperative MRD-1, complications, the change in MRD-1 from surgery, and the mean follow-up period.

The patient's MRD-1 is measured for both eyelids with the patient in a sitting position ensuring the brow is stabilized to prevent recruitment of the frontalis muscle. The patient is reclined to the recumbent position and two drops of 10% phenylephrine is placed in the superior fornix of the ptotic eyelid. The MRD-1 is remeasured approximately five minutes after instillation of the drops. If contralateral ptosis develops, phenylephrine drops are then placed on the opposite eye with the MRD-1 remeasured for both eyelids. If the patient presents with bilateral ptosis, phenylephrine drops are placed in the superior fornices of both eyelids.

The amount of tissue resection is dependent upon the phenylephrine response with 8.5 millimeters of tissue resection achieving the phenylephrine result.³⁰ If the phenylephrine test undercorrects or overcorrects the desired result, more or less conjunctiva and muller's muscle is resected, respectively with the presumption 1mm change in resection leads to approximately 0.3mm correction of blepharoptosis.¹¹ If necessary, a tarsectomy is also added to the procedure to augment the lift with the belief that 1mm of tarsectomy leads to approximately 1mm lift of the eyelid.²⁵

The surgical technique of the MMCR procedure has been previously described elsewhere in detail and will be summarized here.³⁰ The surgery is typically done under monitored anesthesia care. A frontal nerve block is performed with a retrobulbar needle consisting of 1.5ml of 1% lidocaine with 1:100,000 epinephrine injected to the surgical site. A 4-0 silk traction suture is placed 2mm above the upper eyelid lashes through the skin, orbicularis, and superficial tarsus, everting the eyelid over a Desmarr retractor. Several tetracaine drops are placed on the palpebral conjunctiva. A caliper is used to measure the desired amount of muller's muscle and conjunctiva to be resected from the superior tarsal border. This is marked with a 6-0 silk marking suture centrally as well as 7mm temporal and nasal to the central suture. A toothed forceps grasps the conjunctiva and muller's muscle to free its attachments from the levator aponeurosis. The specifically designed ptosis clamp (Bausch & Lomb Storz Company, Manchester, MO, USA) is then placed on the demarcated tissue and locked in place with the Desmarr retractor removed.³¹ If a tarsectomy is to be performed, the desired amount of tarsus to be excised is incorporated into the clamp as well.

A double-armed 5-0 plain gut suture on a spatulated needle is passed in a running horizontal mattress fashion approximately 1.5mm below the clamp from temporal to nasal. The suture passes are typically 2-3 mm apart. However, if a tarsectomy is also performed, the suture passes on the tarsal side are closer to minimize exposed suture that could potentially abrade the cornea. A #15 Bard-Parker blade cuts the tissue incorporated in the clamp and the suture is then passed in a nasal to temporal fashion reapproximating the conjunctival edges. At the temporal wound edge, both arms of the suture are passed through the conjunctiva and retrieved from the wound. The suture is tied off with several throws and cut short allowing the knot to bury into the wound.

If a concurrent upper eyelid blepharoplasty is to be performed, this is done by marking the eyelid crease at the desired height and utilizing the skin-pinch technique to demarcate the amount of skin to remove. After local anesthetic injection with 1% lidocaine with 1:100,000 units of epinephrine, an incision is made in the previously marked areas. The skin-muscle flap is excised with inferior traction on the traction suture. The orbital septum is then opened and the fat sculpted if desired. The inferior edge of the levator aponeurosis is secured to the pretarsal orbicularis with interrupted 6-0 braided polyester suture followed by reapproximation of the superior skin edge to the levator aponeurosis to the inferior skin edge with 6-0 polyglactin suture. The skin is then closed with a running 6-0 silk suture and antibiotic ointment is placed on the eye and sutures. The silk suture is removed in 6 days and the polyglactin suture in 2-3 weeks.

Results

100 eyelids of 69 patients were identified with severe blepharoptosis that met the inclusion criteria. The demographics of our patient population are listed in Table 1. The average age of the patients was 67 years (range: 22-94) and the average follow-up period being 17.5 months (range: 6-80). 17 patients were male and 52 were female. Several patients had concurrent procedures performed that included upper eyelid blepharoplasty, lower eyelid blepharoplasty, and/or tarsal strips. In particular, 51 of 69 patients had a concurrent upper eyelid blepharoplasty. Of these 51 patients, 32 patients had bilateral lower eyelid blepharoplasties and 20 patients had bilateral tarsal strip procedures.

36 patients were identified with severe unilateral ptosis while 33 patients had severe bilateral ptosis. Of the 36 patients with severe unilateral ptosis, 28 patients also had mild to moderate contralateral ptosis that required surgery as well. Of the 33 patients with bilateral severe ptosis, 2 patients elected to have unilateral surgery although they were advised to have a bilateral procedure.

The mean preoperative MRD-1, phenylephrine response, resection amount, postoperative MRD-1, change in MRD-1 after surgery, and levator function are listed in Table 2a. In addition, Tables 2b and 2c subdivide the cohort into groups of patients that did not have a tarsectomy and those that did have a tarsectomy, respectively. Tables 3a-c analyze only patients that did not have any other concurrent procedure performed with the MMCR. Finally, tables 4a-c analyze patients that underwent the MMCR procedure with an upper eyelid blepharoplasty.

Mean preoperative MRD-1 for all severely ptotic eyelids that had surgery was -0.65mm and the mean MRD-1 after phenylephrine was 2.58mm. The average resection amount was 8.77mm and the final average postoperative MRD1 was 3.00mm (Figure 1).

82 eyelids did not have a tarsectomy performed. For this cohort, the mean preoperative MRD-1 was -0.51mm and the mean MRD-1 with phenylephrine was 2.84mm. The mean resection was 8.38mm with the final mean postoperative MRD-1 being 2.98mm.

Of the 18 eyelids with a tarsectomy, the preoperative MRD-1 was -1.31mm and the average MRD-1 with phenylephrine was 1.39mm. The mean resection was 9.5mm + 1.06mm of tarsus and the final mean postoperative MRD1 was 3.08mm. Aside from one eyelid that had 2mm of tarsus removed, all eyelids in the tarsectomy group had 9.5mm of muller's muscle and conjunctiva resected plus 1mm of tarsus.

23 eyelids of 17 patients were identified that had a MMCR procedure with or without tarsectomy without having any other concurrent procedure being performed simultaneously. The mean preoperative MRD-1 was -1.15mm and the average MRD-1 with phenylephrine was 1.76mm. The average resection was 8.89mm with 5 eyelids of 4 patients having a tarsectomy as well. The mean postoperative MRD1 was 3.33mm in this subset of patients.

77 eyelids of 51 patients with severe blepharoptosis also had a blepharoplasty performed on that eyelid. The mean preoperative MRD-1 for these patients was -0.5mm and the average

MRD-1 with phenylephrine was 2.82mm. The average resection amount was 8.73mm with final mean postoperative MRD-1 of 2.90mm.

Symmetry as defined by achieving an MRD-1 within 1mm of the contralateral eyelid was achieved in 91.3% of patients. Two of the six patients that did not achieve symmetry had bilateral severe blepharoptosis preoperatively but declined bilateral surgery as advised, instead electing to have surgery on the more ptotic eyelid only. Both of these patients subsequently underwent a MMCR procedure on the contralateral eyelid.

97.5% of the eyelids in the MMCR only group achieved a lift of 1.5mm or greater in the MRD-1 while 100% of the eyelids that underwent MMCR with tarsectomy achieved a lift of 2.5mm or greater. No contour abnormalities of the eyelids were noted in any of the patients.

Two patients did develop postoperative corneal abrasion. One required bandage contact lens while the other patient was treated with lubrication. Both patients' abrasions resolved in less than one week. Notably, neither of these patients had a tarsectomy.

Discussion

Numerous surgical techniques have been described in the management of blepharoptosis. The choice of treatment is dependent upon the severity of the patient's ptosis, the levator function, the response to phenylephrine, and the surgeon's preference.

For the mild to moderate ptosis with good levator function, multiple treatment options are available. The FS procedure may be performed for the phenylephrine-negative patient while MMCR may be utilized for the phenylephrine-responsive patient.^{1-6,9-16} In addition, external levator advancement can achieve outstanding results as well.¹⁸⁻²⁰ An open sky mullerectomy has also been described for the phenylephrine-negative ptosis patient.¹⁷ For the patient with mild to severe ptosis with fair levator function, a levator resection and advancement is frequently performed. With severe ptosis and poor levator function, maximal levator resection with tarsectomy, Whitnall's slings, or frontalis slings are appropriate options.^{7,8,21-23}

The patient with severe blepharoptosis with good levator function has classically been treated with external approach surgery such as levator advancement.¹⁸⁻²⁰ This is an excellent operation based upon the tenet that the etiology of the ptosis is a severely disinserted or attenuated levator aponeurosis. However, for these patients that also demonstrate an adequate response to phenylephrine, the authors' have successfully been performing MMCR with or without tarsectomy.

The concept of adding a tarsectomy to the MMCR procedure is by no means novel. Perry et al defined an algorithm that called for a 9 millimeter resection of muller's muscle and conjunctiva to achieve the phenylephrine result. A tarsectomy is then added if necessary to achieve a 1:1 elevation in the eyelid height.²⁵ However, the authors stated the algorithm should only be applied to patients with mild to moderate ptosis with good levator function. Other reports of the mullerectomy procedure in the management of blepharoptosis have frequently stated its application should be limited to mild to moderate ptosis as well.^{14-16, 25}

In the FS procedure, several reports have indicated its efficacy in the treatment of blepharoptosis. Fasanella and Servat emphasized the procedure should be 'intended only for cases of minimal ptosis (1.5-2mm).'² Sampath et al found a success rate of 28% with this procedure although this low success rate was likely attributable to poor preoperative selection.⁴ The authors ultimately advised the FS procedure be limited to patients with mild ptosis and good levator function of 10mm or more. Limiting the application of the FS procedure to this subset, success rate can be greater than 90%.³ Samimi et al attempted to quantify the tarsal resection and found an approximately 2:1 ratio of tarsectomy to the amount of ptosis correction.⁴ Notably, a great advantage of the FS procedure is the lack of a required phenylephrine response.

In the present study, the average increase in MRD-1 of 3.49 mm in the subset of patients that did not have a tarsectomy demonstrates the MMCR procedure alone can be effective for the treatment of severe blepharoptosis. The necessary requirement remains that the eyelid has good levator function and shows an adequate response to phenylephrine. The amount of muller's muscle and conjunctiva resected may be adjusted dependent on the eyelid's response to phenylephrine.

On the other hand, if the eyelid responds to phenylephrine but the MRD-1 still remains significantly undercorrected, a tarsectomy may be added to the procedure. In the authors' tarsectomy cohort, the preoperative MRD-1 was more severely ptotic (mean MRD-1 = -1.31mm) than the MMCR-only cohort. In addition, the MRD-1 remained greatly undercorrected after instillation of the phenylephrine drop in this group (mean MRD-1 = 1.39mm). By increasing the amount of muller's muscle and conjunctiva resection to 9.5mm as well as adding approximately 1mm tarsectomy, a much greater lift was achieved than predicted by phenylephrine testing. The mean postoperative MRD-1 in this cohort was 3.08mm, representing a 4.39mm increase in the MRD-1.

The senior author frequently performs a concurrent upper eyelid blepharoplasty in patients with ptosis to address the secondary dermatochalasis that frequently develops from ptosis surgery alone. However, performing concurrent procedures may influence the outcome of the MMCR procedure. Therefore, a subset analysis of patients undergoing mullerectomy without any other concurrent procedure was performed. Although the sample size is small, it is notable that these patients achieved a greater lift from the MMCR procedure with or without tarsectomy (mean increase in MRD-1 = 4.48mm, Table 3a) compared to those patients that had upper eyelid blepharoplasties as well (mean increase in MRD-1 = 3.4mm, Table 4a). This result is consistent with findings from a prior study where performing a concurrent upper eyelid blepharoplasty may actually diminish the lift obtained with a MMCR procedure up to 1mm.³² Two potential theories were offered by the authors to explain this effect.

For one, performing a concurrent upper eyelid blepharoplasty may lead to increase edema in the perioperative period leading to less advancement of the levator aponeurosis. Second, scarring of the skin, orbicularis and septum from the blepharoplasty may restrict upward movement of the eyelid. The authors contended that this may be noted postoperatively by manually elevating the eyelid upward and restriction is encountered.³²

Of significant note, the senior author's technique in performing the upper eyelid blepharoplasty is not uniform amongst surgeons. In this cohort of patients, the septum was always opened and the eyelid crease reconstructed at the desired height. Conversely, a blepharoplasty may also be performed by removing skin or skin-muscle only leaving septum unviolated. Moore et al found that performing a blepharoplasty removing skin only did not affect the outcome of the MMCR procedure.³³

The anatomic basis for the success of the FS and MMCR procedure has been extensively studied. Buckman et al reported on a series of 37 patients that underwent the FS procedure and found 87.5% of the patients had little to no smooth muscle on histological analysis. The authors concluded the success of the procedure is likely dependent upon posterior lamellar shortening and wound cicatrization as well as plication or advancement of muller's muscle-levator aponeurosis complex onto the tarsus.²⁸ Zauberman et al reported on 49 patients treated with the MMCR procedure and found no correlation between the amount of muller's muscle resected and the final result believing posterior lamellar plication or scarring is the primary factor in the success of the operation.²⁴

Marcet et al performed the MMCR procedure on one upper eyelid of 8 cadavers using the contralateral upper eyelid as a control.²⁹ The orbits were then bilaterally exenterated and histopathologic analysis was performed. The levator aponeurosis was found to be plicated in the upper eyelids of the patients that underwent the MMCR procedure. The authors concluded blepharoptosis was relieved by shortening the posterior lamella and internal advancement of the levator aponeurosis. These theories may explain why such a robust lift with the MMCR procedure alone was achieved in our patient population.

Ben Simon et al has shown that MMCR and external levator advancement can achieve comparable postoperative MRD-1 in the treatment of blepharoptosis.³⁴ Notably, the authors did state the external levator advancement subset of patients had more severe ptosis than the MMCR subset.

Limitations of this study include its retrospective design, lack of a masked observer, and a lack of a control. In addition, the performance of concurrent surgeries at the time of the MMCR may certainly affect the final result. When eliminating patients with concurrent surgeries from the analysis, a small sample size is obtained which is a limitation to the study.

A prospective randomized masked controlled trial for patients with severe involutional blepharoptosis treated with MMCR may provide further clarification if the MMCR procedure is consistently effective in the treatment of severe involutional blepharoptosis responsive to phenylephrine. Such a future study should involve performing the ptosis surgeries alone without performing any concurrent procedures such as upper eyelid blepharoplasty allowing for a better analysis of the effect of the ptosis surgery.

Conclusion

Blepharoptosis will continue to be a commonly presented condition given its interference with the patients' visual field.³³ Numerous surgical options are available for the management of these patients as described in this report. MMCR and FS procedures have

historically been reserved for the patient with minimal to moderate blepharoptosis. Our results preliminarily demonstrate that MMCR with or without tarsectomy may be a viable alternative in the management of severe involutional blepharoptosis if the eyelid is responsive to phenylephrine and exhibits good levator function. However, a larger study is certainly needed to analyze the effects of the MMCR surgery alone before a definitive conclusion may be made regarding the procedure's role in the management of severe involutional blepharoptosis. Moreover, our results provide further evidence to the current literature that levator aponeurosis plication is the primary mechanism through which blepharoptosis is corrected in posterior lamella surgeries with tarsectomy augmenting the power of this lift. 3,28,29

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Figure 1.

A) Preoperative photograph with severe blepharoptosis on the left. B) After phenylephrine instilled in the left eye. C) After phenylephrine instilled in both eyes. D) Postoperative result after 6.5mm MMCR on the right and 9.5mm MMCR on the left

Table 1

Demographic data, unilateral versus bilateral surgery, and follow-up period

Gender (N=69 patients, 100 eyelids)	
Male	17 (24.6%)
Female	52 (75.4%)
Unilateral surgery	38 (55.1%)
Bilateral surgery	31 (44.9%)
Mean Age (range)	67 years (22-94)
Mean Follow up (range)	17.5 months (6-80 months)

Table 2a

Mean clinical measurements of all patients with MMCR +/- tarsectomy

ALL EYELIDS (N=100 eyelids)	Mean (range)
MRD-1 pre-operative	-0.65mm (-3mm – 0mm)
MRD-1 phenylephrine	2.58mm (0mm – 5.5mm)
Resection	8.77mm (6.5mm – 9.5mm with 2mm tarsus)
MRD-1 post-operative	3.00mm (0.5mm-5.5mm)
MRD-1	3.65mm (0.5mm-7.5mm)
Levator Function	15.04mm (10-20mm)

Table 2b

Mean clinical measurements of patients with MMCR without tarsectomy

MMCR without tarsectomy (n=82 eyelids)	Mean (range)
MRD-1 pre-operative	-0.51mm (-3mm – 0mm)
MRD-1 phenylephrine	2.84mm (0.5mm-6.5mm)
Resection	8.38mm (6.5mm-9.5mm)
MRD-1 post-operative	2.98mm (0.5mm-5.5mm)
MRD-1	3.49mm (0.5mm-7mm)
Levator Function	15.18mm (10mm-19mm)

Table 2c

Mean clinical measurements of patients with MMCR with tarsectomy

MMCR with tarsectomy (n=18 eyelids)	Mean (range)
MRD-1 pre-operative	-1.31mm (-2.5mm-0mm)
MRD-1 phenylephrine	1.39mm (0-3.5mm)
Resection	9.5mm + 1.06mm tarsus (9.5mm+[1-2mm tarsus])
MRD-1 post-operative	3.08mm (1mm-4.5mm)
MRD-1	4.39mm (2.5mm-7.5mm)
Levator Function	14.39mm (12-20mm)

Table 3a

Mean clinical measurements of all patients with MMCR +/- tarsectomy without concurrent surgeries

MMCR +/- tarsectomy without concurrent surgeries (N=23 eyelids)	Mean (range)
MRD-1 pre-operative	-1.15mm (-3 - 0mm)
MRD-1 phenylephrine	1.76mm (0 - 3.5mm)
Resection	8.89mm (6.5 - 9.5 + 2mm tarsus)
MRD-1 post-operative	3.33mm (1 - 4.5mm)
MRD-1	4.48mm (1.5 - 7.5mm)
Levator Function	14.78mm (10 - 20mm)

Table 3b

Mean clinical measurements of patients with MMCR without tarsectomy, without concurrent surgeries

MMCR without tarsectomy (N=18 eyelids)	Mean (range)
MRD-1 pre-operative	-0.97mm (-3 – 0mm)
MRD-1 phenylephrine	2.06mm (0.5 – 3.5mm)
Resection	8.39mm (6.5-9.5mm)
MRD-1 post-operative	3.22mm (1 – 4.5mm)
MRD-1	4.19mm (1.5-6.5mm)
Levator Function	14.94mm (10-18mm)

Table 3c

Mean clinical measurements of patients with MMCR with tarsectomy, without concurrent surgeries

MMCR with tarsectomy (N=5 eyelids)	Mean (range)
MRD-1 pre-operative	-1.8mm (-3 – -0.5mm)
MRD-1 phenylephrine	0.7mm (0-2mm)
Resection	9.5mm + 1.2mm tarsus (9.5mm + [1-2mm tarsus])
MRD-1 post-operative	3.7mm (2.5-4.5mm)
MRD-1	5.5mm (4-7.5mm)
Levator Function	14.2mm (12-20mm)

Table 4a

Mean clinical measurements of all patients with MMCR +/- tarsectomy and concurrent bilateral upper eyelid blepharoplasty

MMCR +/- tarsectomy and concurrent bilateral upper eyelid blepharoplasty (N=77 eyelids)	Mean (range)
MRD-1 pre-operative	-0.5mm (-2.5 - 0mm)
MRD-1 phenylephrine	2.82mm (0.5 - 6.5mm)
Resection	8.73mm (6.5 - 9.5 + 1mm tarsus)
MRD-1 post-operative	2.90mm (0.5 - 5.5mm)
MRD-1	3.40mm (0.5 - 7mm)
Levator Function	15.11mm (10 - 19mm)

Table 4b

Mean clinical measurements of all patients with MMCR without tarsectomy and concurrent bilateral upper eyelid blepharoplasty

MMCR without tarsectomy (N=64 eyelids)	Mean (range)
MRD-1 pre-operative	-0.375mm (-2 – 0mm)
MRD-1 phenylephrine	3.05mm (0.5-6.5mm)
Resection	8.375mm (6.5-9.5mm)
MRD-1 post-operative	2.91mm (0.5-5.5mm)
MRD-1	3.23mm (0-7mm)
Levator Function	15.24mm (10-19)

Table 4c

Mean clinical measurements of all patients with MMCR with tarsectomy and concurrent bilateral upper eyelid blepharoplasty

MMCR with tarsectomy (N=13 eyelids)	Mean (range)
MRD-1 pre-operative	-1.12mm (-2.5 – 0mm)
MRD-1 phenylephrine	1.65mm (1-3.5mm)
Resection	9.5mm + 1mm tarsus (all patients had this resection amount)
MRD-1 post-operative	2.85mm (1-4.5mm)
MRD-1	3.96mm (2.5-5.5mm)
Levator Function	14.46mm (12-18mm)