

Comparative Study between Muller Muscle Conjunctival Resection versus Conventional Ptosis Surgery in Mild to Moderate Ptosis

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Abstract:

Background: Ptosis is drooping of the upper eyelid. It may be minimal, moderate or severe covering the pupil entirely. Ptosis can affect one or both eyes. Ptosis can be present at birth (congenital) or develop later in life (acquired). This study aimed to compare between the effect of Muller muscle conjunctival resection operation and conventional ptosis surgery operation in mild to moderate ptosis regarding technical difficulty, lid contour, success, rate, complication. **Methods:** This was a prospective study for comparison between Muller muscle conjunctival resection and conventional ptosis surgery in mild to moderate ptosis patients who attend the oculoplastic clinic in the Ophthalmology Department at Benha University Hospital. **Results:** Age (years) in MMCR group ranged from 7 to 25 with mean \pm SD = 14.3 ± 6.96 while in Conventional group the Age (years) ranged from 4 to 10 with mean \pm SD = 7.5 ± 2.32 with statistically significant difference ($p= 0.014$) between the two groups. Levator muscle resection and MMCR were resected among the study groups. LR (mm) in the study population ranged from 14 to 16 with mean \pm SD = 14.8 ± 0.92 . MMCR resected (mm) in the study population ranged from 4 to 8 with mean \pm SD = 6 ± 1.63 . **Conclusion:** Müller's muscle–conjunctival resection is effective for ptosis correction in patients with good Levator muscle function good eyelid symmetry is achieved in most patients.

Keywords: Muller Muscle; Ptosis; Conjunctival Resection; Conventional Ptosis.

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Received:
Accepted:

Introduction

Ptosis is abnormally low positioned upper eyelid, also called blepharoptosis, which can decrease or even occlude the vision completely. It may be congenital or acquired in origin. Proper management requires recognizing the exact etiology and treats it accordingly, whether surgically or medically, to improve patient outcome⁽¹⁾.

Ptosis is classified into congenital or acquired based on the age of presentation; the latter is usually further categorized into five types based on etiology: either neurogenic, myogenic, mechanical, aponeurotic and traumatic⁽²⁾.

Among all cases of ptosis, congenital ptosis is the most common type which seems to be more prevalent in males. Simple congenital ptosis is the most prevalent form of congenital ptosis. Among acquired cases, aponeurotic ptosis is the most common type which usually presents in late adulthood⁽³⁾.

Treatment of ptosis depends upon the underlying etiology, the degree of ptosis, and the function of the levator muscle. In mechanical ptosis, removal of the abnormal structure, i.e., a chalazion, is all that is needed. However, surgical correction is the mainstay of treatment as well as some nonsurgical options available for specific conditions⁽⁴⁾.

Surgical treatment: Surgery is necessary for congenital, ptosis, and all other types when nonsurgical treatment is not beneficial: the underlying cause and preoperative evaluation of ptosis help in determining the procedure of choice⁽⁵⁾.

Levator resection: Levator muscle gets shortened by resecting the muscle if it is not paralyzed completely with mild (2 mm) to moderate (3 to 4 mm) ptosis. There are different approaches for this purpose (5): **Everbursch:** Approach through the skin. **Blaskovics:** Approach through palpebral conjunctiva. **Fasanella-Servat:** A portion of the tarsal plate, palpebral conjunctiva and Muller's muscle get excised along with Levator resection. It is

usually a proposed option in minimal ptosis⁽⁶⁾.

Motais procedure: Action of superior rectus is utilized to elevate the lid if Levator muscle is paralyzed.

Hess's procedure: Frontalis muscle is used to raise the lid if both, the superior rectus and the Levator muscle, are paralyzed.

Frontalis brow suspension: Eyelid is tethered with the frontalis muscle by either fascia tunica obtained from fascia lata or some other suitable synthetic material such as mersiline mesh. It is indicated in severe (over 4 mm) ptosis with poor Levator function, especially in the case of congenital ptosis⁽⁷⁾.

Aponeurotic strengthening: It involves the advancement of aponeurosis, mostly indicated in aponeurotic disinsertion or involutional ptosis⁽⁸⁾.

The purpose of this study was to compare between the effect of Muller muscle conjunctival resection operation and conventional ptosis surgery operation in mild to moderate ptosis regarding technical difficulty, lid contour, success, rate and complication.

Patients and methods

It was a prospective study for comparison between Muller muscle conjunctival resection and conventional ptosis surgery in mild to moderate ptosis who attended to oculoplastic clinic at Ophthalmology Department, Benha University Hospital. The duration period was about one year (from September 2022 to August 2023).

Ethical consideration: All individuals who took part in the study provided written informed consent. The Human Subjects Research Ethics Review Board authorized the project {M.S.29.1.2022}

This study included 20 patients with mild to moderate ptosis classified into 2 groups; Group1: underwent Muller Muscle Conjunctival resection and Group2: underwent conventional ptosis surgery.

Inclusion criteria were patients aged between 5 to 40 years old, both gender, patients with no history of previous eye

diseases (trauma) any systemic diseases and patients with marginal reflex distance (MRD) in mild to moderate ptosis.

The following data were obtained for each study participant: Demographic including age, gender, history of previous intraocular surgery, previous ocular trauma. Full ophthalmic examination including visual acuity assessment, best corrected visual acuity (BCVA), marginal reflex distance (MRD1, MRD2), upper lid excursion, upper lid crease, vertical palpebral fissure height, phenyl-ephrine test by instilling 10% drops into conjunctival sac 3 times for 10 minutes, then amount of lid elevation was measured 15 minutes after last instillation, excluding epicanthus, jaw winking, absent Bell's phenomenon, fatigability, myopathic affection, mythenia graves and Pupil. Post-operative assessment including lid contour, lid height (MRD after surgery) and complication like exposure and notching.

Statistical analysis

All data were collected, tabulated and statistically analyzed using SPSS 26.0 for windows (SPSS Inc., Chicago, IL, USA). Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, standard deviation and median. All statistical comparisons were two tailed with significance Level of P-value ≤ 0.05 indicates significant, $p < 0.001$ indicates highly significant difference while, $P > 0.05$ indicates non-significant difference.

Results

This study was a prospective study for comparison between Muller muscle conjunctival resection and conventional ptosis surgery in mild to moderate ptosis patients who attended to oculoplastic clinic at Ophthalmology Department at Benha University Hospital. This study included 20 patients with mild to moderate ptosis classified into 2 groups: Group 1: underwent Muller Muscle Conjunctival

resection and Group 2: underwent conventional ptosis surgery.

Demographic data among the study groups: Age (years) in MMCR group ranged from 7 to 25 with mean \pm SD = 14.3 ± 6.96 while in Conventional group the Age (years) ranged from 4 to 10 with mean \pm SD = 7.5 ± 2.32 with statistical significant difference ($p = 0.014$) between the two groups. Regarding Gender, there was no statistical significant difference between the two studied groups ($p = 0.639$). Table 1

Pre-operative Marginal reflex distance and vertical palpebral fissure height among the study groups. MRD1 (mm) in MMCR group ranged from 2 to 3 with mean \pm SD = 2.5 ± 0.41 while in Conventional group the MRD1 (mm) ranged from 1 to 2 with mean \pm SD = 1.6 ± 0.52 with highly statistical significant difference ($p = <.001$) between the two groups. PFH (mm) in MMCR group ranged from 8 to 9 with mean \pm SD = 8.4 ± 0.46 while in Conventional group the PFH (mm) ranged from 8 to 10 with mean \pm SD = 8.5 ± 0.71 with no statistical significant difference ($p = 0.713$) between the two groups. Table 2

LFT (mm) in MMCR group ranged from 10 to 12 with mean \pm SD = 10.8 ± 0.79 while in Conventional group the LFT (mm) ranged from 7 to 10 with mean \pm SD = 8.6 ± 1.33 with highly statistical significant difference ($p = <.001$) between the two groups. Table 2

Operation time, post-operative marginal reflex distance and post-operative palpebral fissure height among the study groups. Operation time (min) in MMCR group ranged from 20 to 40 with mean \pm SD = 30.4 ± 5.74 while in Conventional group the Operation time (min) ranged from 50 to 70 with mean \pm SD = 59.7 ± 5.54 with highly statistical significant difference ($p = <.001$) between the two groups. MDR after surgery (mm) in MMCR group ranged from 3 to 4 with mean \pm SD = 3.65 ± 0.41 while in Conventional group the MDR after surgery

(mm) ranged from 4 to 4.5 with mean \pm SD = 4.15 ± 0.24 with statistical significant difference ($p= 0.005$) between the two groups. Table 2

PFH after surgery (mm) in MMCR group ranged from 9 to 11 with mean \pm SD =

9.75 ± 0.72 while in Conventional group the PFH after surgery (mm) ranged from 9 to 12.5 with mean \pm SD = 9.95 ± 1.32 with no statistical significant difference ($p= 0.68$) between the two groups. Table 2

Table 1: Demographic data among the study groups.

	MMCR group (n = 10)	Conventional group (n = 10)	Test of Sig.	p
Age (years)				
Mean \pm SD.	14.3 \pm 6.96	7.5 \pm 2.32	t = 2.93	0.014
Median (IQR)	14 (8 - 20.25)	8 (5.25 - 9.75)		
Range (Min-Max)	18 (7 - 25)	6 (4 - 10)		
Gender				
- Male	6 (60%)	7 (70%)	X ² = 0.22	0.639
- Female	4 (40%)	3 (30%)		

χ^2 : Chi- Square test, **SD**: standard deviation, **IQR**: interquartile range, **t**: Independent T test, **p**: p value for comparing between the studied groups, P-value > 0.05: Non-significant; P-value < 0.05: Significant; P-value < 0.001: Highly significant.

Table 2: Pre-operative, Operation time, post-operative marginal reflex distance and post-operative palpebral fissure height among the study groups.

	MMCR group (n = 10)	Conventional group (n = 10)	Test of Sig.	p
Marginal reflex distance 1 (mm)				
Mean \pm SD.	2.5 \pm 0.41	1.6 \pm 0.52	t = 4.323	<0.001
Median (IQR)	2.5 (2.12 - 2.88)	2 (1 - 2)		
Range (Min-Max)	1 (2 - 3)	1 (1 - 2)		
Vertical palpebral fissure height (mm)				
Mean \pm SD.	8.4 \pm 0.46	8.5 \pm 0.71	t = -0.375	0.713
Median (IQR)	8.25 (8 - 8.88)	8 (8 - 9)		
Range (Min-Max)	1 (8 - 9)	2 (8 - 10)		
LFT (mm)				
Mean \pm SD.	10.8 \pm 0.79	8.6 \pm 1.33	t = 4.501	<0.001
Median (IQR)	11 (10 - 11)	8.5 (7.25 - 10)		
Range (Min-Max)	2 (10 - 12)	3 (7 - 10)		
Operation time (min)				
Mean \pm SD.	30.4 \pm 5.74	59.7 \pm 5.54	t = -11.617	<0.001
Median (IQR)	30 (28.25 - 34)	60.5 (56.25 - 62.5)		
Range (Min-Max)	20 (20 - 40)	20 (50 - 70)		
Marginal reflex distance (mm)				
Mean \pm SD.	3.65 \pm 0.41	4.15 \pm 0.24	t = -3.313	0.005
Median (IQR)	3.75 (3.5 - 4)	4 (4 - 4.38)		
Range (Min-Max)	1 (3 - 4)	0.5 (4 - 4.5)		
Palpebral fissure height (mm)				
Mean \pm SD.	9.75 \pm 0.72	9.95 \pm 1.32	t = -0.421	0.68
Median (IQR)	10 (9 - 10)	9.25 (9 - 10.38)		
Range (Min-Max)	2 (9 - 11)	3.5 (9 - 12.5)		

t: Independent T test, **SD**: standard deviation, **IQR**: interquartile range, **p**: p value for comparing between the studied groups, P-value > 0.05: Nonsignificant; P-value < 0.05: Significant; P-value < 0.001: Highly significant.

Post-operative evaluation results among the study groups. Regarding Lid contour, there was no statistical significant difference between the two studied groups ($p= 0.136$). Regarding Over Correction, there was no statistical significant difference between the two studied groups ($p= 0.305$). Regarding Under Correction, there was no statistical significant

difference between the two studied groups ($p= 0.531$). Table 3

Levator muscle resection and MMCR resected among the study groups. LR (mm) in the study population ranged from 14 to 16 with mean \pm SD = 14.8 ± 0.92 . MMCR resected (mm) in the study population ranged from 4 to 8 with mean \pm SD = 6 ± 1.63 . Table 4

Table3: Post-operative evaluation results among the study groups.

	MMCR group (n = 10)	Conventional group (n = 10)	Test of Sig.	p
Lid contour				
- Normal	10 (100%)	8 (80%)	X2 = 2.222	0.136
- Abnormal	0 (0%)	2 (20%)		
Over Correction				
- Yes	0 (0%)	1 (10%)	X2 = 1.053	0.305
- No	10 (100%)	9 (90%)		
Under Correction				
- Yes	1 (10%)	2 (20%)	X2 = 0.392	0.531
- No	9 (90%)	8 (80%)		

χ^2 : Chi- Square test, **p**: p value for comparing between the studied groups, P-value > 0.05: Non-significant; P-value < 0.05: Significant; P-value < 0.001: Highly significant.

Table 4: Levator muscle resection and MMCR resected among the study groups.

	MMCR group (n = 10)
Levator muscle resection (mm)	
Mean \pm SD.	14.8 \pm 0.92
Median (IQR)	14.5 (14 - 15.75)
Range (Min-Max)	2 (14 - 16)
MMCR resected (mm)	
Mean \pm SD.	6 \pm 1.63
Median (IQR)	6 (4.5 - 7.5)
Range (Min-Max)	4 (4 - 8)

SD: standard deviation, IQR: interquartile range

Discussion

Regarding operative procedure time, our study showed statistically significant difference between MMCR procedure and Levator resection procedure with a mean of 30.4 ± 5.74 minutes in the former and 59.7 ± 5.54 in the latter. Our results were comparable with the results obtained by ⁽⁹⁾ (34.1 ± 14.21 minutes for the MMCR cases and 45.7 ± 13.3 minutes for the Levator advancement cases) and (20.4 ± 3.9 for the MMCR cases and 44.9 ± 8.6 for the Levator advancement cases). Shorter operative time with MMCR procedures

favors its adoption in the appropriate cases as this will lead to more patient's comfort and shorter postoperative recovery period. ⁽¹⁰⁾

Regarding the postoperative complications, although the difference was not statistically significant between both groups, but the lid contour abnormalities were reported in 20% of Levator resection cases versus 0% in MMCR cases. Also, the occurrence of overcorrection was not reported in any cases with MMCR. These findings were comparable to the results obtained by various researchers as demonstrated on the metanalysis by which

included 7 different studies⁽¹¹⁾. In their work, they concluded that the rate of overcorrection was significantly higher in the Levator resection surgery compared to the MMCR procedure with an odd ratio of 0.17. They also reported lower rate of total number of complications in the MMCR procedure. Lid contour abnormalities also were less in MMCR patients compared to Levator resection patients in the work done by who reported 0% lid contour abnormalities in the MMCR group of patients versus 20% in Levator advancement group of patients.⁽¹²⁾ Regarding Pre-operative Marginal reflex distance and among the study groups. MRD1 (mm) in MMCR group with mean of 2.5 ± 0.41 while in Conventional group the MRD1 (mm) with mean of 1.6 ± 0.52 with highly statistical significant difference ($p = <.001$) between the two groups. These finding were comparable to the result obtained by, who reported that in patients with mild to moderate ptosis underwent MMCR procedures, the mean Pre-operative Marginal reflex distance was 1.95 ± 0.25 and who reported that in patients underwent MMCR procedures the mean preoperative MRD1 was 1.5 ± 1.3 .^(13,14)

Regarding the amount needed for resection to correct ptosis between MMCR and Levator resection, our results showed Levator muscle resection and MMCR resected among the study groups. LR (mm) in the conventional group with mean of 14.8 ± 0.92 and MMCR resected (mm) in the study population with mean of 6 ± 1.63 . These finding were comparable to the result obtained by with who reported that in in patients with mild to moderate ptosis underwent MMCR procedures, was (8.78 ± 0.41) and Levator resection was 14.96 ± 2.12 .⁽¹³⁾

Also, who aimed to explore the relationship between the amount of resected Müller's muscle-conjunctiva (MMCR) and clinical outcome in patients undergoing upper eyelid ptosis surgery,

they reported that most patients had an MMCR with mean of (8.5 ± 1.2 mm).⁽¹⁵⁾

Regarding post-operative marginal reflex distance and among the study groups. MDR after surgery (mm) in MMCR group with mean of 3.65 ± 0.41 while in Conventional group the MDR after surgery (mm) with mean of 4.15 ± 0.24 with statistical significant difference ($p = 0.005$) between the two groups. These were comparable to the result obtained by who reported that in MMCR group, the mean postoperative MRD1 was $2.35 \pm (0.66)$ mm after the MMCR surgery and who reported that in MMCR there is improvement in margin-to-reflex distances, with the mean of 1.4 mm (SD = 0.64) among all patients.^(16,17)

Also, who demonstrated Postoperatively in conventional group patients achieved a better eyelid position, with change in MRD1 of 1.6 mm. The MRD1 increased from 1.5 mm preoperatively to 3.1 mm postoperatively.⁽¹⁸⁾

Conclusion

Müller's muscle-conjunctival resection is effective for ptosis correction in patients with good Levator muscle function good eyelid symmetry is achieved in most patients.

Sources of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author contribution

Authors contributed equally in the study.

Conflicts of interest

No conflicts of interest

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To cite this article: Ahmed E. Daifalla, Husam M. Faramawi, Fatma E. Aldokary. Comparative Study between Muller Muscle Conjunctival Resection versus Conventional Ptosis Surgery in Mild to Moderate Ptosis. *BMFJ* XXX, DOI: 10.21608/bmfj.2024.284190.2062.