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ORIGINAL ARTICLE

Cosmetic

Three Different Anesthesia Approaches in Blepharoptosis Surgery

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Background: Despite the many methods of anesthesia for blepharoptosis, there is little documentation in the literature. When using the Müller aponeurosis composite flap advancement approach, one of the 3 anesthesia methods is chosen: general, local, and sedative anesthesia. On the other hand, the choice of anesthesia method is controversial.

Methods: A total of 101 patients (48 female and 53 male) admitted to hospital for treatment were selected: 38 (37.6%) patients (49 eyes) with local anesthesia, 34 (33.7%) patients (60 eyes) with general anesthesia, and 29 (28.7%) patients (42 eyes) with sedative anesthesia.

Results: The preoperative average marginal reflex distance (MRD1) in the local, general, and sedative anesthesia groups was 0.90, 0.35, and 0.47 mm, respectively. The corneal exposure area (CEA) in the local, general, and sedative approach groups was 63.2%, 57.8%, and 55.9%, respectively. The postoperative average distance for the MRD1 was significantly different among the 3 anesthesia approaches. The postoperative MRD1 in the local approach group was 3.28 mm and the CEA improved to 75.4%. In the general anesthesia approach group, the MRD1 was 3.01 mm and the CEA was 73.4%. In the sedative anesthesia approach group, the MRD1 and CEA were 3.62 mm and 74.0%, respectively. The MRD1 in the general, local, and sedative groups was 2.65 ± 1.48, 2.39 ± 1.65, and 3.17 ± 1.77, respectively; the difference was not significant ($P > 0.05$).

Conclusions: The general, local, and sedative anesthesia approaches are all effective in the correction of blepharoptosis; the results were similar regardless of the anesthesia approach. On the other hand, the patients felt more comfortable and surgeons could control the process more easily using the sedative approach. *(Plast Reconstr Surg Glob Open 2019;7:e2136; doi: 10.1097/GOX.0000000000002136; Published online 8 April 2019.)*

INTRODUCTION

Ptosis can be classified as congenital or acquired, where 70% of congenital diagnoses present as unilateral or bilateral disorders of the upper eyelids.[6]

Treatments of blepharoptosis have been under development for 100 years and are still being refined. Essentially, the method for selecting the appropriate blepharoptosis treatment has been well documented and more surgeons choose to use the Müller aponeurosis composite flap advancement technique.[9] Many factors affect the surgical outcomes, one of which is the choice of suitable anesthesia approach. Because there has been little research on anesthesia approaches for blepharoptosis treatment, the method for selecting the appropriate anesthesia approach for blepharoptosis treatment is based only on the severity of ptosis, and the surgeon's personal skill and experience. This article focuses on the outcomes of 3 different anesthesia approaches, as well as the advantages and disadvantages of the approaches when performing the procedure.[1,6]

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Received for publication September 6, 2017; accepted December 12, 2018.

DOI: 10.1097/GOX.0000000000002136

Disclosure: *The authors have no financial interest to declare in relation to the content of this article.*

Supplemental digital content is available for this article. Clickable URL citations appear in the text.

Table 1. Distribution of Patients according to Age, Sex, and Etiology

Age	Male	Female	Unilateral		Bilateral	Cause		Total No. Patients
			Right	Left		Congenital	Acquired	
0–10	6	0	3	1	2	6	0	6
11–20	12	15	1	4	22	23	4	27
21–30	18	2	2	7	11	17	3	20
31–40	4	4	2	3	3	7	1	8
41–50	2	11	5	5	3	11	2	13
51–60	4	6	2	3	5	8	2	10
>61	8	9	4	5	8	12	5	17
Total	54	47	19	28	54	84	17	101

MATERIALS AND METHODS

Patients

This study compared the outcomes of 101 blepharoptosis cases operated on under 3 different anesthesia approaches: general, local, and sedative anesthesia. The Müller aponeurosis composite flap advancement procedure was performed by 1 senior consultant from 2010 to 2016.

Thirty-four (60 eyelids), 38 (49 eyelids), and 29 (42 eyelids) patients received general anesthesia, local anesthesia, and sedative anesthesia, respectively (Table 1).

Methods

Preoperatively, the ptosis degree of severity and the levator and frontal muscle functions were measured. The marginal reflex distance (MRD1) and eyebrow height were recorded (Table 2).

Accurate measurements in 2-dimensional views were acquired by measuring the corneal exposure area (CEA) to record the severity of blepharoptosis.[1]

The selection of the anesthesia approach was based primarily on patients' condition (whether they could cooperate or not) and not by the preoperative MRD or levator function. Patients who can coordinate were included in the local anesthesia or sedative groups. Patients too young to cooperate were assigned to the general anesthesia group.

Anesthesia Approach

General Anesthesia Approach

General anesthesia was induced by an intravenous injection of either pentothal sodium or propofol followed by the inhalation of sevoflurane (2.5–3.5 vol%) and a 1:1 mixture of N_2O:O_2 at 3 L/min.[5,7,8]

Table 2. Preoperative MRD1

Degree of MRD1	General Anesthesia; n = 34 (60 Eyelids)	Local Anesthesia; n = 38 (49 Eyelids)	Sedative Anesthesia; n = 29 (42 Eyelids)
No. eyelids (%)			
<1 mm	9 (15%)	23 (45.1%)	11 (25%)
0–1 mm	17 (28.3%)	10 (19.6%)	12 (27.3%)
−1 to 0 mm	23 (38.3%)	5 (9.8%)	10 (22.7%)
>−1 mm	11 (18.3%)	13(25.5%)	11(25%)
Average	0.35 mm	0.90 mm	0.47mm

Local Anesthesia Approach

A local injection of lidocaine/adrenaline with a normal saline solution (mL) (2%–4%) was performed. The maximum medication dose was no more than 4.5 mg/kg.

Sedative Anesthesia Approach

The sedatives group was based on local anesthetics with an additional intravenous injection of precedex 0.5 μg/kg/h. The medication was stopped when the patients were required to wake up.

Surgical Methods

The Müller aponeurosis composite flap advancement was used in this study. Before the operation, we measure the levator function and degree of ptosis. We decided how much advancement of aponeurosis before operation according to the degree of ptosis and the levator function. Usually, we decided 3 mm advancement Muller aponeurosis flap for 1 mm of ptosis correction. The skin crease was marked, and an upper eyelid crease incision was performed, followed by a dissection through the orbicularis. The preaponeurotic fat was identified as a guide to the levator muscle. Local anesthesia was then applied to the conjunctiva to achieve a hydrodissection effect, followed by a vertical incision through the upper transconjunctiva. The Müller muscle was separated from the conjunctiva using blunt scissors, and the Müller muscle was then detached carefully from the superior portion of the tarsus. The Müller muscle-levator aponeurosis flap was then dissected and advanced with a resection if needed. The elevated flap was fixed to the tarsal plate at the appropriate level with a 5-0 polydioxanone suture at 2 to 3 points.[1]

During operation, we adjust the lid level according to preoperative calculation. We do not use a gaping technique. But, we made a symmetrical gap in bilateral ptosis cases. We decided to resect a portion of the flap after we fix the Müller aponeurosis flap to tarsus. If the length of the remnant flap is long and over the skin incision margin, then we resect the remnant portion of the flap. How much flap excision depends on how much flap there is over the skin incision margin. The flap over the skin incision was resected.

There is no specific method to calculate the exact eye position changes in patients under general anesthesia. For adult, a recommended method is to mark the level of the superior limbus on the patient's nasal dorsum when in the primary gaze position. Otherwise, Krimsky's test result is needed to adjust the position of the upper eyelid fixation 30 min after

anesthesia induction. If it is not possible to achieve both individual modification and preoperative markings according to eyes position change, the 1-mm fixation level below the superior limbus is recommended for surgical correction.[5]

RESULTS

A total of 101 patients (48 female and 53 male) were admitted to hospital for treatment, including 38, 34, and 29 patients with local, general, and sedative anesthesia, respectively. The mean age of the patients was 35.75±20.76 (4–80 years). The average follow-up period was 23 months (Table 1).

The mean preoperative MRD1 of the patients who received general, local, and sedative anesthesia was 0.35, 0.90, and 0.47 mm, respectively (Table 2), and preoperative levator fuction of the patients was 6.36, 8.04, and 5.73 mm. The mean postoperative MRD1 value of the general, local, and sedative anesthesia groups was 3.01, 3.28, and 3.62 mm, respectively (Table 3).

The preoperative and postoperative CEAs were also checked (Tables 4 and 5). The improvement of the MRD1 and CEA was slightly different in the 3 techniques; the degree of improvement was greater in the sedative anesthesia approach group than in the other 2 anesthesia techniques. The improvement of the MRD1 was 3.18, 2.66, and 2.40 mm in the sedative, general, and local anesthesia approaches, respectively (Table 6). The CEA was increased by 18%, 15.5%, and 12.1% for the sedative, general, and local groups, respectively (Table 7).

The outcomes of MRD1 for the sedative anesthesia technique were considered excellent in 83.3% of cases, good in 11.9%, fair in 2.4%, and poor in 2.4% (Table 3). The outcomes for the general anesthesia approach were excellent in 46.7% of cases, good in 35%, fair in 18.3%, and no poor cases (Table 3). The outcomes for the local anesthesia approach were excellent in 64% of cases, good in 24%, fair in 12%, and no poor case (Table 3).

Table 3. Postoperative Degree of MRD1

Degree of MRD1	General Anesthesia Approach	Local Anesthesia Approach	Sedative Anesthesia Approach
No. eyelids (%)			
<3 mm (excellent)	28 (46.7%)	32 (64%)	35 (83.3%)
2–3 mm (good)	21 (35%)	12 (24%)	5 (11.9%)
1–2 mm (fair)	11 (18.3%)	6 (12%)	1 (2.4%)
>1 mm (poor)	0(0%)	0 (0%)	1 (2.4%)
Average	3.01 mm	3.28 mm	3.62 mm

Table 4. Preoperative CEA

Degree of MRD1	General Anesthesia Approach; n = 34 (60 Eyelids)	Local Anesthesia Approach; n = 38 (49 Eyelids)	Sedative Anesthesia Approach; n = 29 (42 Eyelids)
No. eyelids (%)			
>40%	5 (8.3%)	4 (8.2%)	6 (14.3%)
40%–50%	10 (16.7%)	2 (4.1%)	2 (4.8%)
50%–60%	22 (36.7%)	10 (20.4%)	15 (35.7%)
<60%	23 (38.3%)	33 (67.3%)	19 (45.2%)
Average	57.8%	63.2%	55.9%

Table 5. Postoperative CEA

Degree of CEA	General Anesthesia Approach	Local Anesthesia Approach	Sedative Anesthesia Approach
No. eyelids (%)			
<70% (excellent)	36 (60%)	35 (71.4%)	28 (66.7%)
60%–70% (good)	16 (26.7%)	8 (16.3%)	9 (21.4%)
50%–60% (fair)	8 (13.3%)	4 (8.2%)	3 (7.1%)
>50% (poor)	0 (0%)	2 (4.1%)	2 (4.8%)
Average	73.4%	75.4%	74%

DISCUSSION

The Müller aponeurosis composite flap advancement and frontalis muscle transfer is the most common method for blepharoptosis correction.[5] The levator muscle is the main cause of blepharoptosis because it lifts the upper eyelid main muscles. Therefore, regardless of the anatomy or physiology, the Müller aponeurosis composite flap advancement to treat ptosis is an ideal choice, and has been used in recent years for patients with severe ptosis with a good curative effect.[4]

Under the Müller aponeurosis composite flap advancement approach, 3 anesthesia approaches are available for the surgeon: local, general, and sedative anesthesia (**see**

Table 6. Improvement of the MRD1 after Surgery and Preoperative Levator Function (Average)

Anesthesia	Preoperative Levator Function; Mean ± SD(mm)	Preoperative MRD1; Mean ± SD(mm)	Postoperative MRD1; Mean ± SD(mm)	DiffMRD1(Improvement); Mean ± SD(mm)
1 General; n = 34 (60)	6.36±2.01	0.35±0.959	3.01±1.131	2.66±1.496
2 Local; n = 38 (49)	8.04±2.84	0.90±1.647	3.28±1.138	2.40±1.564
3 Sedative; n = 29 (42)	6.73±2.88	0.47±1.498	3.62±1.115	3.18±1.780
P	0.008	0.22	0.029	0.098

Table 7. Improvement of the CEA after Surgery (Average)

Anesthesia	Preoperative CEA	Postoperative CEA	DiffOPCEA
1 General; n = 34 (60)	57.8% ± 12.1%	73.4% ± 10.6%	15.5% ± 10.6%
2 Local; n = 38 (49)	63.2% ± 15.5%	75.4% ± 12.2%	12.1% ± 10.4%
3 Sedative; n = 29 (42)	55.9% ± 14.7%	74.0% ± 11.7%	18.0% ± 14.9%
P	0.035	0.668	0.198

Under correction and eyelid asymmetry were the most common postoperative complications encountered in both techniques.
Under correction was observed in 18.3%, 12.0 %, and 4.8% in the general, local, and sedative anesthesia groups, respectively (Table 3).

Video Graphic 1. See video, Supplemental Digital Content 1, which displays steps in a blepharoptosis surgery. This video is available in the "Related Videos" section of the Full-Text article on PRSGlobalOpen.com or available at http://links.lww.com/PRSGO/B16.

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Patients with local anesthesia can remain awake during surgery, so the surgeon can determine the upper eyelid levator muscle strength and observe the upper eyelid position during surgery, which can help the surgeon avoid postoperative under correction and eyelid asymmetry. The disadvantage is that the patient may suffer more pain and discomfort during the operation than under general anesthesia. On the other hand, under general anesthesia, the patient can feel more comfortable and relax, but the preoperative anesthesia group requires preoperative fasting for a long time and the patients are unable to cooperate intraoperatively. In addition, the surgeon cannot observe the MRD1 or measure the upper eyelid levator muscle strength, and it is difficult to determine the upper eyelid margin and amount of lift. During general anesthesia, the eyes are under the quiet eye position, slightly separate and showing supravergence, and the eyeballs show mild extorsion at the supine position.[7] Severe congenital ptosis has been reported in children who underwent surgery under general anesthesia because the palpebral fissure height was measured based on the upper eyelid muscle strength and frontal muscle strength, and combined with general anesthesia, the depth and eye position were used to evaluate the curative effects.[8] Others also reported local anesthesia to be a feasible option for pediatric frontalis sling surgery.[10]

The sedative groups had both advantages. First, the anesthetic technique ensures that the patients can be woken at any time in the operation, same as the local anesthesia group, and it is easy to perform an observation and assessment. Second, the sedative provides good comfort and decreases the tension and discomfort, which can reduce the time of surgery. The patients do not need to fast for a long time, which will reduce the burden on patients.

These results show that in the sedative anesthesia group, the change in the postoperative MRD1 was slightly higher than in the other 2 groups (Table 3) with statistical significance, and the CEA change was slightly better (Tables 6 and 7). This might have been caused by its essen-

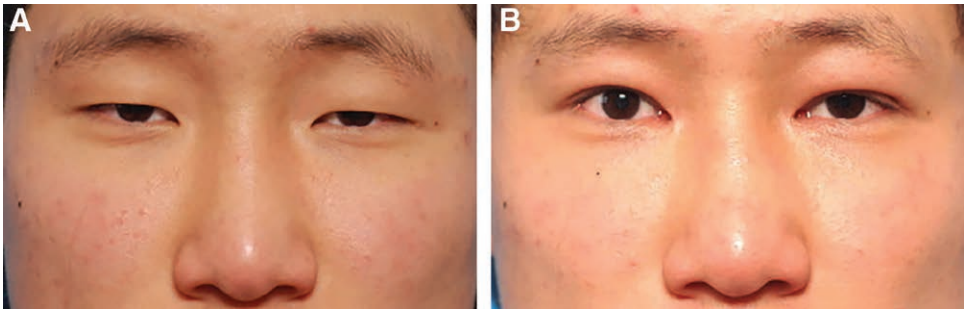

Fig. 1. Müller aponeurosis composite flap advancement procedure with the general anesthesia approach. A, Preoperative view of a 21-year-old man with congenital severe bilateral blepharoptosis. Preoperative evaluation (right eye: MRD1, 0 mm; CEA, 57% and left eye: MRD1, −1 mm; CEA, 49%). B, Three-month postoperative evaluation (right eye: MRD1, 3.52 mm; CEA, 83% and left eye: MRD1, 2.37 mm; CEA, 62%).

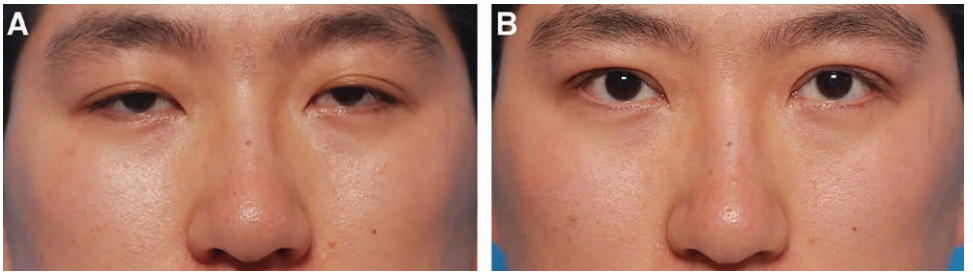

Fig. 2. Müller aponeurosis composite flap advancement procedure with local anesthesia approach. A, Preoperative view of a 25-year-old man with congenital severe bilateral blepharoptosis. Preoperative evaluation (right eye: MRD1, −1 mm; CEA, 63% and left eye: MRD1, −1 mm; CEA, 62%). B, Three-month postoperative evaluation (right eye: MRD1, 3.87 mm; CEA, 82% and left eye: MRD1, 3.68 mm; CEA, 81%).

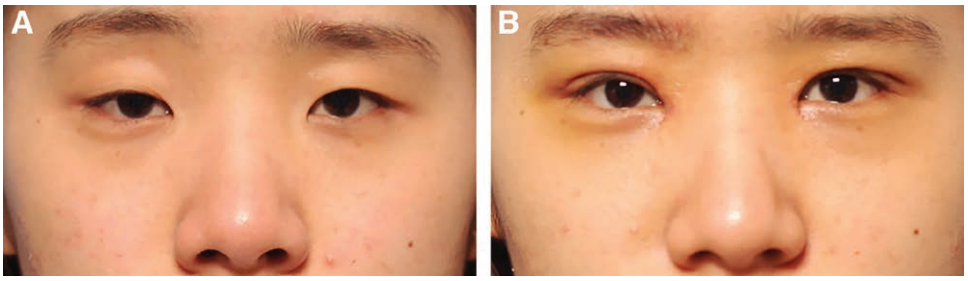

Fig. 3. Müller aponeurosis composite flap advancement procedure with the sedative anesthesia approach. A, Preoperative view of an 18-year-old woman with congenital severe bilateral blepharoptosis. Preoperative evaluation (right eye: MRD1, 0.5 mm; CEA, 66% and left eye: MRD1, 2 mm; CEA, 79%). B, Three-month postoperative evaluation (right eye: MRD1, 3.69 mm; CEA, 83% and left eye: MRD1, 3.73 mm; CEA, 80%).

tial grouping or that the sedative anesthesia approach has some beneficial effects on blepharoptosis. On the other hand, the difference in MRD1 among the 3 groups was not significant ($P > 0.05$).

In this study, the authors could significantly refine the indications for the Müller aponeurosis composite flap advancement for the correction of blepharoptosis using the 3 anesthesia approaches. Sedative anesthesia may be a better choice if the patient's feeling can be measured.

CONCLUSIONS

All 3 anesthesia approaches are effective in blepharoptosis correction.

The precedex approach can be the first choice if the patients can cooperate, because the patients feel more comfortable and they can be woken during surgery to confirm the correction effects, also it can reduce the dosage of lidocaine epinephrine, which can make the eyes more symmetrical.

The study also shows that the precedex approach may create a better CEA and MRD1 results, but it requires further research.

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