The main prognostic factors influencing the results of the superior tarsal muscle resection in patients with blepharoptosis

© E.V. Goltsman 1, V.V. Potemkin 1,2, D.V. Davydov 3

1 City Multidisciplinary Hospital No. 2, Saint Petersburg, Russia;
2 Academic I.P. Pavlov First St. Petersburg State Medical University of the Ministry of Healthcare of the Russian Federation, Saint Petersburg, Russia;
3 Peoples’ Friendship University of Russia, Moscow, Russia


Transconjunctival methods of ptosis correction gain popularity nowadays. The wide use of the technique is limited because of the lack of clear recommendations regarding the volume of the resection, especially in patients with negative phenylephrine test. **Purpose.** To assess the influence of main predictive factors on superior tarsal muscle (STM) resection result. **Materials and methods.** Patients were divided into two groups according to the result of phenylephrine test (PE). Patients with positive results were included in the first group, with negative and weak results — in the second group. All patients underwent STM resection according our new algorithm. **Results.** The result of STM resection was influenced by PE test and intraoperative white line motility test (WLM), but not by levator function and the amount of superior tarsal muscle resection. **Conclusions.** PE and WLM tests play main role in choosing a method for blepharoptosis correcting.

**Keywords:** blepharoptosis; superior tarsal muscle resection; phenylephrine test.
INTRODUCTION

Blepharoptosis treatment is one of the most controversial aspects of modern ophthalmic plastic surgery. This is due to the lack of clear recommendations for the choice of surgical correction method. When choosing a treatment method, most specialists pay attention to the main factors, namely, the levator palpebrae superioris (LPS) function and blepharoptosis degree. Thus, severe blepharoptosis and poor LPS function (≤ 4 mm) are an indication for surgery using a suspensory material [1–4]. However, as for superior tarsal muscle (STM) or LPS aponeurosis resection, the situation is ambiguous since both methods can be used for moderate or mild blepharoptosis and excellent or good LPS function.

The epoch of transconjunctival approaches in the surgical treatment of blepharoptosis began in 1961 (Fasanella–Servat surgery) [9–11]. During this period, the methodology was modified several times. One latest modification was proposed by Lake et al. in 2003 [7]. Many algorithms are used for calculating STM resection amount. The most commonly used ones are those proposed by J.D. Perry et al. [12], S.C. Dresner [8], and S. Lake et al. [7]. The authors of the article previously proposed a new algorithm for superior tarsal muscle resection, the main difference of which is an intraoperative assessment of white line mobility to determine the possibility of superior tarsal muscle resection and its amount in cases of negative and weakly positive responses to phenylephrine (PE) test [15]. Thus, the need for search of additional factors that could be used as predictors of the superior tarsal muscle resection results is beyond doubt [5, 6].

The aim of present study is to evaluate the effect of PE test, of white line (WL) mobility, resected STM length, and of LPS function on the results of transconjunctival STM resection in patients with mild and moderate blepharoptosis, provided that the LPS function is good or excellent.

MATERIALS AND METHODS

A total of 75 patients (103 eyelids) with mild and moderate blepharoptosis were examined, when admitted for surgical treatment to the ophthalmological department No. 5 of St. Petersburg City Multi-Field Hospital No. 2 from November 2017 to August 2019.

Patients with the following conditions were excluded from the study:
• severe blepharoptosis,
• blepharoptosis of a traumatic or neurogenic nature,
• blepharoptosis accompanied by poor or moderate function of the LPS (8 mm or less),
• history of trauma that led to blepharoptosis development,
• history of surgeries to repair blepharoptosis, as well as any surgeries requiring the blepharostat application, and
• a history of various anti-aging procedures (botulinum therapy, permanent makeup, false eyelashes, etc.).

The patients were divided into two groups based on their PE test results. The PE test was performed according to the standard technique [11, 19]: a 2.5% PE solution (Irifrin, Sentiss, Switzerland) was instilled into the superior conjunctival fornix twice with a 5-min interval [12]. Measurements of the MRD1 (Margin reflex distance 1, the distance from the center of the corneal light reflex to the upper eyelid margin in its middle in millimeters) index were performed before instillation and 5 min after the last phenylephrine’s instillation. The PE test results were assessed as follows: if the differences in MRD1 before and after instillation of 2.5% PE were 0–0.5, 1–1.5, and ≥2 mm, the test was considered to be negative, weakly positive, and positive, respectively [14, 20].

Group 1 included patients with positive (“+”) responses to the PE test (37 patients, 50 eyelids) and group 2 – with negative and weakly positive (“−” and “+/−”) responses (38 patients, 53 eyelids). The average ages of patients in groups 1 and 2 were 62.6 ± 8.6 and 64.6 ± 7.8 years, respectively (p = 0.52). There were 37.8% of men and 62.2% of women in group 1, and 55.2% of men and 44.8% of women in group 2 (p = 0.1).

All patients underwent modified STM resection according to the previously proposed technique, presented below. The PE test, resected superior tarsal muscle length, white line mobility, and LPS function were the factors influencing the STM resection result.
Technique of STM modified resection

After treating the facial skin with an antiseptic solution, a traction suture (Vicryl 4.00) was placed in the upper eyelid middle. Then, the upper eyelid was turned inside out using the Desmarrres lid retractor (Fig. 1, a). After superior tarsal muscle hydrodissection with 1.0 mL of 0.9% isotonic sodium chloride solution (Fig. 1, b), the conjunctiva with STM was cut off from the upper edge of the tarsal plate, and the latter was mobilized bluntly (Fig. 1, c and d). The next stage was the assessment of STM length and of white line mobility.

Method for assessing STM length

After isolation of the STM, its length in the middle was measured using a surgical caliper (Fig. 2).

Method for assessing white line mobility

After isolating the white line, its mobility was assessed using a surgical caliper by pulling the center of the STM myogaster along the line of the muscle fibers until displacement cessation (Fig. 3).

Then, the planned amount of the STM was resected (Fig. 4, e). The STM stump was fixed with a U-shaped suture (Vicryl 6.0) to the edge of the tarsal plate (Fig. 4, f). The surgery ended after the placement of a running suture fixing the conjunctiva to the tarsal plate without bringing the suture out (Vicryl 6.0; Fig. 4, g). Considering that the suture material is absorbable, suture removal was not required.

The LPS function was assessed at the preoperative stage by the amplitude of the upper eyelid movement.
Distribution of received data in groups

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Groups</th>
<th>Significance, ( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platinum degree before surgery, mm</td>
<td>with “+” responses to phenylephrine test, ( n = 50 )</td>
<td>3.3 ± 0.9</td>
</tr>
<tr>
<td></td>
<td>with “+/–” and “–” responses to phenylephrine test, ( n = 53 )</td>
<td>2.46 ± 0.66</td>
</tr>
<tr>
<td>Result of STM resection, mm</td>
<td></td>
<td>2.74 ± 1.0</td>
</tr>
<tr>
<td>Phenylephrine test, mm</td>
<td></td>
<td>2.18 ± 0.18</td>
</tr>
<tr>
<td>LPS function, mm</td>
<td></td>
<td>13.4 ± 2.0</td>
</tr>
<tr>
<td>Amount of STM resected, mm</td>
<td></td>
<td>12.8 ± 3.4</td>
</tr>
<tr>
<td>White line mobility, mm</td>
<td></td>
<td>1.78 ± 1.0</td>
</tr>
</tbody>
</table>

Note. \( n \), number of eyelids; STM, superior tarsal muscle; LPS, levator palpebrae superioris.
Due to the widespread use of PE test, we decided to evaluate the dependence of STM resection primarily on its result. The data obtained indicate a moderate relationship according to the Chaddock scale in both groups ($R = 0.31$, $p = 0.03$ in group 1 and $R = 0.33$, $p = 0.018$ in group 2). This suggests that PE test must be used when deciding on the feasibility of STM resection, but only if other factors are considered.

The resected STM amount and LPS function do not influence the STM resection result.

The “white line” concept was introduced into our practice not long ago by E.A. Vanderson et al. [18], who, in their studies, demonstrated, both macroscopically and histologically, that this zone is a transition from LPS striated muscle fibers to STM smooth muscle fibers. According to our data, the assessment of white line mobility had no effect on the STM resection result in group 1, whereas a significant high dependence was revealed in group 2 ($R = 0.02$, $p = 0.99$, and $R = 0.72$, $p = 0.0005$, respectively). Thus, white line mobility has to be studied in cases of negative and weakly positive responses to PE tests. Moreover, this indicator may be the main factor determining the possibility of STM resection in this patient category.

**CONCLUSION**

The decision on the choice of a particular technique for correcting blepharoptosis and its extent has to be made on the basis of a combination of factors such as the PE test result and the degree of white line mobility.

**REFERENCES**


Information about the authors

Elena V. Goltsman — Ophthalmologist. City Multidisciplinary Hospital No. 2, Saint Petersburg. E-mail: ageeva_elena@inbox.ru.

Vitaly V. Potemkin — PhD, Assistant Professor. Department of Ophthalmology. First Pavlov State Medical University of St. Petersburg, Saint Petersburg; Ophthalmologist, City Multidisciplinary Hospital No. 2, Saint Petersburg. E-mail: potem@inbox.ru.

Dmitriy V. Davydov — MD, PhD, DMedSc, Professor, Head of Department, Reconstructive Surgery Department with Ophthalmology Course. Peoples’ Friendship University of Russia, Moscow, Russia. E-mail: d-davydov3@yandex.ru.

Elena Владимировна Гольцман — врач-офтальмолог. СПбГБУЗ «Городская многопрофильная больница № 2», Санкт-Петербург. E-mail: ageeva_elena@inbox.ru.

Виталий Витальевич Потемкин — канд. мед. наук, доцент кафедры офтальмологии, ГБОУ ВПО ПСПбГМУ им. И.П. Павлова Минздрава России, Санкт-Петербург; врач-офтальмолог, СПбГБУЗ «Городская многопрофильная больница № 2», Санкт-Петербург. E-mail: potem@inbox.ru.

Дмитрий Викторович Давыдов — д-р мед. наук, профессор, заведующий кафедрой реконструктивно-пластической хирургии с курсом офтальмологии. ФГАОУ ВО «Российский университет дружбы народов», Москва. E-mail: d-davydov3@yandex.ru.