SOLARZ, Adam, SZABELSKI, Szymon, SKIBICKA, Katarzyna, GRACZYK, Estera, CWALINA, Oliwia, KRYŚLAK, Joanna, SOKOŁOWSKI, Maciej, OSKROBA, Karolina, TURCZA, Jakub Filip and WOŚ, Małgorzata. Ptosis: Clinical overview, etiology and treatment. Quality in Sport. 2025;41:59951. eISSN 2450-3118.
https://doi.org/10.12775/QS.2025.41.59951
https://apcz.umk.pl/QS/article/view/59951

The journal has been 20 points in the Ministry of Higher Education and Science of Poland parametric evaluation. Annex to the announcement of the Minister of Higher Education and Science of 05.01.2024. No. 32553.
Has a Journal's Unique Identifier: 201398. Scientific disciplines assigned: Economics and finance (Field of social sciences); Management and Quality Sciences (Field of social sciences).
Punkty Ministerialne z 2019 - aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 r. Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398.
Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych).

The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 31.03.2025. Revised: 25.04.2025. Accepted: 05.05.2025. Published: 11.05.2025.

Ptosis: Clinical overview, etiology and treatment

Adam Solarz
Stefan Żeromski Specialist Hospital in Kraków
e-mail: adam.solarz@poczta.onet.eu
https://orcid.org/0009-0005-6039-8449

Szymon Szabelski
University Clinical Hospital No. 2 of the Medical University of Łódź
e-mail: szabelskiszymon8@gmail.com
https://orcid.org/0009-0002-5621-2590

Katarzyna Skibicka
Jan Biziel University Hospital No. 2 in Bydgoszcz
e-mail: ka.skibicka@gmail.com
https://orcid.org/0009-0001-3192-9301

Estera Graczyk
University Clinical Hospital No. 2 of the Medical University of Łódź
e-mail: esteragracz98@gmail.com
https://orcid.org/0009-0006-4901-0172

Oliwia Cwalina
Prof. K. Gibiński University Clinical Center of the Medical University of Silesia in Katowice
email: oliwia.cwalina97@gmail.com
https://orcid.org/0000-0002-7071-0273

Joanna Kryślak
University Clinical Hospital in Poznań
e-mail: joanna0kryslak@gmail.com
https://orcid.org/0009-0004-5678-2643

Maciej Sokołowski
Stefan Żeromski Specialist Hospital in Kraków
e-mail: sokolowskimaciej17@gmail.com
https://orcid.org/0009-0009-8559-0620

Karolina Oskroba
Ludwik Rydygier Collegium Medicum in Bydgoszcz, Nicolaus Copernicus University in Toruń
e-mail: karolinaoskroba1@gmail.com
https://orcid.org/0009-0003-7169-2841

Małgorzata Woś
Stefan Żeromski Specialist Hospital in Kraków
e-mail: mwos@zeromski-szpital.pl
https://orcid.org/0000-0003-3184-9958

Jakub Filip Turcza
Department of Cosmetology and Aesthetic Medicine, Medical University of Lublin
e-mail: jakub.turcza@umlub.pl
https://orcid.org/0009-0004-3609-8772

Ptosis: Clinical overview, etiology and treatment

Abstract
Ptosis is a condition characterized by a low setting of the upper eyelid caused by congenital or acquired dysfunction of the levator muscle. The problem can occur unilaterally or bilaterally, in any age group, and affects over 1 million patients in Poland, with varying degrees of severity. Drooping of the upper eyelid leads to secondary restriction of the visual field, deterioration of vision quality, as well as a subjective decrease in visual acuity. Additionally, it is an aesthetic defect, which consequently negatively impacts the patient's quality of life, self-esteem, and social perception. This article presents key information about ptosis, including clinical implications, etiology, and classification, as well as diagnostic algorithms and methods, and modern surgical treatment approaches.

Objective
A review of selected articles, literature, and the latest reports on upper eyelid ptosis, its etiology and classification, diagnostic methods, and modern treatment approaches.

Materials and Methods
A literature review of scientific articles available on PubMed and Google Scholar.

Key words
ptosis, blepharoptosis, frontalis sling procedure, tarsoaponeurectomy, mullerectomy

Introduction
Ptosis (from the Greek *ptosis* – "falling"), or the drooping of the upper eyelid below its normal position, is a condition that can affect individuals of any age group. According to estimates, approximately 11.5% of adults over the age of 55 in the United Kingdom have ptosis, with the frequency of its occurrence increasing with age. A 2017 publication reported that the prevalence of upper eyelid ptosis was 13.5% in the adult Korean population (5.4% in individuals aged 40; 32.8% in those over 70). A correlation between ptosis and certain conditions such as diabetes, obesity, and hypertension has also been demonstrated. The issue significantly impacts the patient's self-esteem and psychological well-being. Patients with ptosis most often report problems with low mood, increased levels of anxiety, and difficulties in forming interpersonal relationships. Clinically, ptosis leads to secondary restrictions in the visual field, deterioration in vision quality, and a subjective decrease in visual acuity. In addition to the direct consequences resulting from the drooping eyelid, patients also report discomfort and pain in the neck and cervical area, which are the result of forced, compensatory head positioning intended to correct the eyelid defect and expand the visual field. [1] [2] [3]

Etiology
Ptosis can be congenital or acquired. Congenital ptosis is diagnosed before the age of 1, while ptosis that manifests after the first year of life is considered acquired. Most cases of congenital upper eyelid drooping result from improper development of the levator palpebrae superioris muscle (myogenic ptosis), whereas the most common cause of acquired ptosis is involutional changes in the aponeurosis or detachment of its insertion (involutional ptosis). Congenital causes may include conditions such as fibrosis of the extraocular muscles, Duane's retraction syndrome, or Marcus Gunn jaw-winking syndrome.

Acquired ptosis associated with a systemic disease is referred to as non-isolated ptosis, while isolated ptosis occurs independently, without any underlying systemic condition. Isolated ptosis is most often the result of a disturbance in the function or anatomical position of the musculus levator palpebrae superioris.

Non-isolated ptosis can be classified according to its underlying cause into the following types:

- **Neurogenic ptosis**: This is caused by paralysis of the oculomotor nerve (*nervus oculomotorius*), Horner's syndrome, or central nervous system disorders.
- **Neuromuscular ptosis**: Occurs in autoimmune diseases, such as myasthenia gravis.
- **Neurotoxic ptosis**: Results from the action of insect venom or improper administration of botulinum toxin.
- **Myopathic ptosis**: Caused by dysfunction of the levator palpebrae superioris muscle.
- **Mechanical ptosis**: Results from local conditions, such as a chalazion, which causes excessive pressure on the eyelid margin, leading to drooping.
- **Post-traumatic ptosis**: Caused by injury to the eyelid muscle, for example, due to a blow or trauma.

In the literature, the term "pseudoptosis" is also used to describe various types of apparent ptosis that result from conditions such as enophthalmos (sunken eyeball), retraction of the eyelid of the opposite eye, tuberculosis, or facial nerve paralysis. [4] [5]

Diagnosis and Qualification for Surgery
The foundation of proper ptosis diagnosis is a thorough medical history, with particular attention to the onset of eyelid drooping, family history, previous surgeries or trauma involving the eyeball and ocular adnexa, as well as coexisting diseases that may indirectly or directly induce ptosis. It is essential to rule out neurological conditions such as Horner's syndrome, myasthenia gravis, oculomotor nerve (cranial nerve III) palsy, and CPEO (Chronic Progressive External Ophthalmoplegia).
Physical examination is a key component of diagnosis and the proper selection of surgical techniques. During

differential diagnosis, the physician should be mindful of excluding conditions that cause "pseudoptosis," including anatomical abnormalities of the orbital region (e.g., eyeball asymmetry), mechanical causes (e.g., brow ptosis, floppy eyelid syndrome), and retraction of the opposite eyelid. The physician should also observe the patient's characteristic head posture (e.g., chin elevation to expand the visual field), as well as the presence of static wrinkles on the forehead (due to compensatory elevation of the brows and eyelids by the frontalis muscle). [6]

In the ophthalmic examination, it is essential to carefully assess visual acuity and ocular motility, examine the bony boundaries of the orbit, and evaluate the soft tissues in this area. Using a slit lamp, the physician should rule out other eyelid pathologies and thoroughly assess the anterior segment of the eye (including the evaluation of eyelid margin gland disorders and the cornea).

To assess the severity of eyelid drooping, several measurements can be used:

- **MRD1 (Margin-Reflex Distance 1)**: This is the distance between the upper eyelid margin and the corneal reflex. The normal value in a healthy eye is 4–5 mm. Eyelid drooping is present if this distance is reduced. Drooping of 1-2 mm indicates minimal ptosis, 3-4 mm indicates moderate ptosis, and a value >4 mm indicates a severe degree of ptosis.
- **MRD2 (Margin-Reflex Distance 2)**: This measures the distance between the lower eyelid margin and the corneal reflex. The normal value in a healthy eye is 5–5.5 mm.
- **Palpebral Fissure Height (PFH)**: This is the distance between the upper and lower eyelid margins along the pupillary axis. The total of MRD1 and MRD2 should equal the PFH. A reduction in the palpebral fissure height is often associated with the detachment of the levator palpebrae superioris aponeurosis from its attachment to the tarsal plate of the upper eyelid.
- **Berk's Method**: This evaluates the function of the levator palpebrae superioris muscle. The measurement involves eliminating the action of the frontalis muscle by pressing it with the thumb and then measuring the movement of the upper eyelid. The range of movement is the distance the eyelid margin moves from a downward gaze to an upward gaze, with the head positioned in the coronal plane.
    - **Berk's Classification**:
        - Normal levator function: >15 mm
        - Good function: 12–14 mm
        - Moderate function: 5–11 mm
        - Poor function: 0–4 mm. [5], [6], [7], [8]

Tests Used for Ptosis Diagnosis:

- **Fatigue Test**: First, measure MRD1, then ask the patient to gaze upward maximally for 2 minutes. After the required 2 minutes, remeasure MRD1. A reduction in MRD1 may indicate myasthenia gravis, as well as age-related ptosis.
- **Ice Pack Test**: An ice-filled glove is applied to the closed eyelid with ptosis for 2 minutes. If the eyelid lifts by 2 mm or more immediately after the test, this suggests myasthenia gravis.
- **Tensilon Test**: Performed when myasthenia gravis is suspected. The test involves slow intravenous injection (over 15-30 seconds) of 2 mg edrophonium, a reversible acetylcholinesterase inhibitor. An additional 8 mg is slowly injected after one minute. If ptosis improves after the injection, the cause is likely myasthenia gravis.
- **Phenylephrine Test**: Adrenergic agents, such as phenylephrine or apraclonidine, are instilled under the eyelid to assess the function of Müller's muscle. The test involves measuring MRD1 before and 5 minutes after administering the phenylephrine solution. If MRD1 increases by 2–3 mm or if eyelid elevation is noticeable and clinically significant, the test is considered positive. In such cases, the most common treatment is a transconjunctival Müller's muscle resection. A corrective levator muscle repair is recommended if the test result is negative. [5], [6], [9], [10]

The selection of the appropriate surgical method is challenging and depends on the severity of the ptosis, as well as being optimized for the specific case. Recent studies regarding indications for surgery and the testing of new surgical techniques present difficulties in choosing the most suitable approach.
The qualification of a patient for surgical treatment of ptosis should consider not only the potential benefits of

the procedure but also the undesirable effects associated with surgical intervention. Patients eligible for ptosis surgery are not limited to those seeking aesthetic improvements, but also include those for whom drooping eyelids interfere with daily functioning due to visual field restriction.

In children, when the risk of amblyopia (lazy eye) is significant, surgery should not be delayed. However, if the risk of amblyopia is low, it may be advisable to wait until the child reaches 3-5 years of age, at which point necessary measurements can be taken and the patient can be considered for surgical treatment. [5]

One of the most common methods for qualifying a patient for ptosis surgery is the technique developed by Dresner in the late 20th century. This method involves determining the extent of Müller's muscle resection based on eyelid drooping and its elevation following the administration of 10% phenylephrine into the eye. After 5 minutes of drug application, the elevation of the eyelid is measured. An elevation of at least 2 mm results in a positive test. According to Dresner's principle, for every 1 mm of eyelid elevation, 4 mm of Müller's muscle must be resected. For larger ptosis corrections, a proportionally larger resection of the muscle is required. For instance, a 1.5 mm elevation requires a 6 mm resection of the muscle, while an 8 mm resection results in a 2 mm eyelid elevation. A 10 mm muscle resection causes a 3 mm eyelid lift. A clinically significant issue with this technique is that it is not recommended for correcting ptosis greater than 3 mm. In the case of a negative phenylephrine test, the patient should be considered for a levator aponeurosis repair, also using the "Whitnall's ligament loop." This procedure is also suitable for patients with moderate ptosis (3-4 mm). In cases of frontalis sling surgery, the procedure is indicated when there is ptosis with impaired levator palpebrae superioris function, but with preserved frontalis muscle function. Furthermore, this method may be used in cases of congenital, myopathic, or neurogenic ptosis. The aforementioned methods have their own advantages and disadvantages, which will be discussed in the next section of this article. [5] [11] [12]

When selecting the appropriate surgical method, it is also important to consider the potential and predictable adverse effects. The most commonly encountered complications include bleeding, bruising, and infection. As for sequelae that may require further corrections, these include any abnormalities in the eyelid sulcus, eyelid asymmetry, or overcorrection/undercorrection of the ptosis. [13]

Treatment

Surgical methods remain the standard for treating eyelid ptosis. Effective treatment, whether for aesthetic or functional reasons, can be achieved using a specific procedure or a combination of techniques, depending on the severity of the ptosis and its etiology. It is crucial during the patient examination and preoperative planning phase to exclude conditions that require immediate intervention, including those that go beyond the capabilities of oculoplastic surgery. As of current knowledge, there is no single universal method for treating ptosis.

Fasanella-Servat Technique

The Fasanella-Servat technique is the oldest surgical method for treating ptosis, developed in 1961 by Fasanella and Servat. The procedure involves using two pairs of forceps to secure the tarsal plate, conjunctiva, and Müller's muscle on the inverted upper eyelid. Since the 1960s, the technique has undergone several modifications, such as changes in the suturing method, placement of the knot, and improved techniques for maintaining hemostasis in the surgical field.

The main advantage of this method is the lack of a skin incision and preservation of the natural eyelid contour. Indications for using this technique include acquired involutional ptosis (commonly associated with aging), Horner's syndrome, ptosis as a complication following other procedures with an anterior approach, and congenital ptosis with preserved levator palpebrae superioris function. [14] [15] [16]

Müller's Muscle-Connunctival Resection Technique

One of the most widely used techniques for ptosis surgery is the Müller's muscle-conjunctival resection. Like the Fasanella-Servat procedure, this surgery targets Müller's muscle. The operation involves excising Müller's muscle along with the overlying conjunctiva, after which the remaining muscle edges are sutured. A limitation of this procedure is that the maximum elevation achievable is 2-3 mm. The procedure is performed through a posterior approach, which shortens the recovery time, eliminates visible scarring, improves predictability of the final result, and is technically easier for the surgeon compared to other techniques, such as levator aponeurosis

repair. This technique is typically used for mild ptosis with well-preserved levator muscle function. It can also be useful for ptosis correction in Horner's syndrome and in mild cases of congenital ptosis. [5] [13] [17]

Levator Aponeurosis Repair
The most common cause of upper eyelid ptosis is the separation of the levator aponeurosis, which makes levator aponeurosis repair the most frequently performed procedure in the surgical treatment of ptosis. The fundamental technical aspect of this procedure is the repositioning of the aponeurosis to its anatomical location. This surgery is performed in patients who have normal levator muscle function but exhibit a noticeable defect in the aponeurosis. Signs of such a defect include an elevated eyelid sulcus, a thinner upper eyelid, and a visible corneal outline. This technique offers several clinically significant advantages. The greatest benefit is the ability to perform the procedure under general anesthesia, which eliminates potential issues associated with local anesthesia (such as difficulties in achieving the correct degree of ptosis correction and the need for patient cooperation). [15] [18]

Tarsoaponeurectomy
Tarsoaponeurectomy is a surgical technique that involves the resection of the anatomical structures of the upper eyelid. The operation is performed through an incision along the upper eyelid sulcus, exposing the tarsal plate and the levator aponeurosis. The resection typically involves removing the full thickness of tissue, up to 2 mm in depth. This procedure is used in patients with ptosis caused by tissue scarring, such as from ocular trauma or previous surgical interventions. A prerequisite for performing this surgery is that the levator palpebrae superioris muscle must be functioning adequately. In practice, tarsoaponeurectomy is rarely used, primarily in cases where there are difficulties identifying the individual anatomical planes. [18]

Frontalis Sling Procedure
The frontalis sling procedure is indicated in patients with dysfunction of the levator palpebrae superioris muscle, but with preserved function of the frontalis muscle. This surgery is typically performed in cases of congenital ptosis, neurogenic ptosis, and myopathic ptosis. The procedure involves the use of synthetic materials (such as silicone or Gore-Tex) or autologous tissue (e.g., strips of temporal fascia or broad thigh fascia). The technique involves the insertion of a prepared material into a selected point on the frontalis muscle using a needle or guide. In the final stage, the supporting material should form a characteristic pentagon shape, which is a hallmark of this technique. In pediatric patients, synthetic materials are more commonly used due to the limited availability of fascia. However, the preferred option in this technique remains the use of broad thigh fascia, although it presents certain limitations, such as difficulty harvesting the fascia in very young children, elderly individuals, or those who are debilitated. When using fascia from the patient, there is a lower risk of infection and degradation compared to synthetic materials. [5], [19]

Postoperative Care
Patients who have undergone surgery for ptosis should be thoroughly instructed by their attending physician on several important aspects that significantly influence their recovery process. To reduce swelling following the surgical intervention, patients should sleep with their head elevated and apply cold compresses to the operated areas. Some surgeons may recommend the use of topical antibiotics or steroids to promote healing and reduce inflammation. Sutures are typically removed within one week after the procedure.

Postoperative Results
At the time of publishing this article, there are no large randomized studies comparing surgical techniques for the treatment of ptosis. However, there are studies that determine the rate of revision surgeries for specific methods. The results of available studies vary greatly in many aspects, but they are consistent in one regard: the outcomes for patients with advanced ptosis and significant fibrosis show a higher rate of post-operative revisions. Ultimately, the most important factor determining the success of a given treatment method is the surgeon. [20]

Complications and Postoperative Issues
In the course of treating any disease with surgical methods, there is a percentage of patients who experience complications or postoperative issues. Revision surgeries should be performed after a period of time following the primary surgery that allows for the resolution of swelling. Delaying the procedure for too long can lead to the formation of intratissue scars, which may result in difficulties during subsequent surgery.

In the case of underestimation of the eyelid correction, revision surgery is necessary. When qualifying a patient for a repeat blepharoplasty procedure, the degree of eyelid asymmetry and the ptosis of the previously operated eyelid should be taken into account to ensure the planned procedure is justified. During the qualification process, the surgeon must conduct a thorough examination of the local condition, assessing the presence of postoperative swelling and the healing status of the wounds.

Hypercorrection may occur as a result of eyelid ptosis correction. It is caused by an excessive correction of the existing defect, which clinically results in an inability to close the eyelid. In such cases, methods should be applied to stretch the eyelid and allow for full closure of the eye. This procedure should be performed within 7 days of the primary surgery. If the procedure causes discomfort for the patient, it can be carried out under local anesthesia. In cases requiring larger corrections, it is recommended to wait 6 months after the primary surgery. [21]

In the course of the procedure, the surgeon must exercise increased caution. Surgeries involving the ocular protective apparatus carry a risk of damaging the eyeball. During the surgery, appropriate measures should be taken to protect the cornea from injury, as well as to ensure proper eye lubrication, especially if, after the surgery, eyelid closure is incomplete. In the event of an intraoperative eye injury, it is essential to consult a specialist in this field as quickly as possible.

After oculoplastic procedures, a common symptom is the occurrence of dry eyes. If such complaints are identified, treatment is necessary, as neglecting this complication may lead to permanent consequences. The patient should be advised to use medications that improve eye lubrication (drops or ointments). Some authors recommend using cyclosporine-based medications in more severe cases, as they work by stimulating tear production. [22]

Summary

Ptosis is a widespread issue affecting individuals of all age groups. As a condition that can result from various abnormalities, it requires specialized examination and evaluation. Treatment of eyelid ptosis is a complex procedure that demands considerable experience from the medical center performing it. Surgical treatment of ptosis has also become a part of aesthetic medicine, where the outcome largely depends on the patient's subjective feelings. Improper choice of surgical method and failure to effectively address potential complications can result in patient dissatisfaction, or even disfigurement. Conservative treatment attempts are often ineffective and do not provide satisfactory results. However, promising outcomes have been observed with the newly introduced 0.1% oxymetazoline hydrochloride preparation, which shows potential for use in non-surgical ptosis treatment. This could serve as an alternative for patients who are unwilling to undergo surgery. Effective treatment of eyelid ptosis requires the physician to conduct a meticulous examination and make an accurate diagnosis. It is essential to determine the cause of the ptosis, which dictates the choice of the appropriate surgical technique. Moreover, after the procedure, the patient should regularly attend follow-up appointments, so that any necessary interventions can be planned in advance and performed at the right time. Further research is needed to determine which surgical method offers the best therapeutic approach, providing patients with the desired aesthetic and functional outcomes. [23], [24], [25], [26]

Author`s contribution:

Conceptualization: Jakub Turcza, Adam Solarz, Szymon Szabelski

Methodology: Jakub Turcza, Adam Solarz, Szymon Szabelski

Software: Katarzyna Skibicka, Estera Graczyk, Oliwia Cwalina, Joanna Kryślak

Check: Jakub Turcza, Małgorzata Woś

Formal analysis: Jakub Turcza, Małgorzata Woś

Investigation: Katarzyna Skibicka, Estera Graczyk, Oliwia Cwalina, Joanna Kryślak, Maciej Sokołowski, Karolina Oskroba

Resources: Adam Solarz, Szymon Szabelski, Katarzyna Skibicka, Estera Graczyk, Oliwia Cwalina, Joanna Kryślak, Maciej Sokołowski, Karolina Oskroba

Data curation: Adam Solarz, Szymon Szabelski, Maciej Sokołowski, Karolina Oskroba

Writing-rough preparation: Szymon Szabelski, Adam Solarz, Estera Graczyk, Oliwia Cwalina, Adam Solarz Szymon Szabelski

Writing-review and editing: Katarzyna Skibicka, Estera Graczyk, Oliwia Cwalina, Joanna Kryślak, Maciej Sokołowski, Karolina Oskroba

Supervision: Jakub Turcza, Małgorzata Woś

Project administration: Jakub Turcza, Małgorzata Woś, Adam Solarz, Szymon Szabelski

All authors have read and agreed with the published version of the manuscript.

Founding Statement: The study did not receive funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflict of Interest Statement: The authors declare no conflicts of interest.

Acknowledgments: Not applicable.

Bibliography

1. Sridharan GV, Tallis RC, Leatherbarrow B, Forman WM. A community survey of ptosis of the eyelid and pupil size of elderly people. Age Ageing. 1995 Jan;24(1):21-4. doi: 10.1093/ageing/24.1.21.
2. Kim MH, Cho J, Zhao D, Woo KI, Kim YD, Kim S, Yang SW. Prevalence and associated factors of blepharoptosis in Korean adult population: The Korea National Health and Nutrition Examination Survey 2008-2011. Eye (Lond). 2017 Jun;31(6):940-946. doi: 10.1038/eye.2017.43. Epub 2017 Mar 24.
3. Richards HS, Jenkinson E, Rumsey N, White P, Garrott H, Herbert H, Kalapesi F, Harrad RA. The psychological well-being and appearance concerns of patients presenting with ptosis. Eye (Lond). 2014 Mar;28(3):296-302. doi: 10.1038/eye.2013.264. Epub 2013 Dec 20.
4. Mokhtarzadeh A, Harrison AR. Controversies and advances in the management of congenital ptosis. Expert Rev Ophthalmol. 2015 Jan 2;10(1):59-63. doi: 10.1586/17469899.2015.991389. Epub 2014 Dec 12.
5. Pauly, Marian; Sruthi, R.. Ptosis: Evaluation and management. Kerala Journal of Ophthalmology 31(1):p 11-16, Jan–Apr 2019. | DOI: 10.4103/kjo.kjo_2_19
6. Latting MW, Huggins AB, Marx DP, Giacometti JN. Clinical Evaluation of Blepharoptosis: Distinguishing Age-Related Ptosis from Masquerade Conditions. Semin Plast Surg. 2017 Feb;31(1):5-16. doi: 10.1055/s-0037-1598188.

7. Finsterer J. Ptosis: causes, presentation, and management. Aesthetic Plast Surg. 2003 May-Jun;27(3):193-204. doi: 10.1007/s00266-003-0127-5. Epub 2003 Aug 21.
8. Meyer DR, Stern JH, Jarvis JM, Lininger LL. Evaluating the visual field effects of blepharoptosis using automated static perimetry. Ophthalmology. 1993 May;100(5):651-8; discussion 658-9. doi: 10.1016/s0161-6420(93)31593-9.
9. Maheshwari R, Maheshwari S. Muller's muscle resection for ptosis and relationship with levator and Muller's muscle function. Orbit. 2011 Jun;30(3):150-3. doi: 10.3109/01676831003666447.
10. Nair AG, Patil-Chhablani P, Venkatramani DV, Gandhi RA. Ocular myasthenia gravis: a review. Indian J Ophthalmol. 2014 Oct;62(10):985-91. doi: 10.4103/0301-4738.145987.
11. Shubhra G, Cat Nguyen B. Expert Techniques in Ophthalmic Surgery; Chapter-61 Ptosis Repair: Müllerectomy 2019.
12. Monsul NT, Patwa HS, Knorr AM, Lesser RL, Goldstein JM. The effect of prednisone on the progression from ocular to generalized myasthenia gravis. J Neurol Sci. 2004 Feb 15;217(2):131-3. doi: 10.1016/j.jns.2003.08.017.
13. Bacharach J, Lee WW, Harrison AR, Freddo TF. A review of acquired blepharoptosis: prevalence, diagnosis, and current treatment options. Eye (Lond). 2021 Sep;35(9):2468-2481. doi: 10.1038/s41433-021-01547-5. Epub 2021 Apr 29.
14. FASANELLA RM, SERVAT J. Levator resection for minimal ptosis: another simplified operation. Arch Ophthalmol. 1961 Apr;65:493-6. doi: 10.1001/archopht.1961.01840020495005.
15. Farber SE, Codner MA. Evaluation and management of acquired ptosis. *Plast Aesthet Res*. 2020;7:20. http://dx.doi.org/10.20517/2347-9264.2020.05
16. Beard C. The surgical treatment of blepharoptosis: a quantitative approach. Trans Am Ophthalmol Soc. 1966;64:401-87. PMID: 5337430; PMCID: PMC1310245.
17. Baldwin HC, Bhagey J, Khooshabeh R. Open sky Müller muscle-conjunctival resection in phenylephrine test-negative blepharoptosis patients. Ophthalmic Plast Reconstr Surg. 2005 Jul;21(4):276-80. doi: 10.1097/01.iop.0000167789.39570.3e.
18. McCord CD, Seify H, Codner MA. Transblepharoplasty ptosis repair: three-step technique. Plast Reconstr Surg. 2007 Sep 15;120(4):1037-1044. doi: 10.1097/01.prs.0000278000.36558.98.
19. Beyer-Machule CK. Congenital ptosis and complications of ptosis surgery. Plast Reconstr Surg. 1988 May;81(5):789-99. doi: 10.1097/00006534-198805000-00028.
20. Chang S, Lehrman C, Itani K, Rohrich RJ. A systematic review of comparison of upper eyelid involutional ptosis repair techniques: efficacy and complication rates. Plast Reconstr Surg. 2012 Jan;129(1):149-157. doi: 10.1097/PRS.0b013e318230a1c7. Erratum in: Plast Reconstr Surg. 2015 May;135(5):1507.
21. Codner MA, McCord DC, editors. Upper lid blepharoplasty. Eyelid and periorbital surgery. 2nd ed. New York: Thieme; 2017. pp. 229-56.
22. Pacella SJ, Codner MA. Minor complications after blepharoplasty: dry eyes, chemosis, granulomas, ptosis, and scleral show. Plast Reconstr Surg. 2010 Feb;125(2):709-718. doi: 10.1097/PRS.0b013e3181c830c7.
23. Lim JM, Hou JH, Singa RM, Aakalu VK, Setabutr P. Relative incidence of blepharoptosis subtypes in an oculoplastics practice at a tertiary care center. Orbit. 2013 Aug;32(4):231-4. doi: 10.3109/01676830.2013.788673. Epub 2013 May 10.
24. Satariano N, Brown MS, Zwiebel S, Guyuron B. Environmental factors that contribute to upper eyelid ptosis: a study of identical twins. Aesthet Surg J. 2015 Mar;35(3):235-41. doi: 10.1093/asj/sju070.
25. Godfrey KJ, Korn BS, Kikkawa DO. Blepharoptosis following ocular surgery: identifying risk factors. Curr Opin Ophthalmol. 2016 Jan;27(1):31-7. doi: 10.1097/ICU.0000000000000218.
26. Slonim CB, Foster S, Jaros M, Kannarr SR, Korenfeld MS, Smyth-Medina R, Wirta DL. Association of Oxymetazoline Hydrochloride, 0.1%, Solution Administration With Visual Field in Acquired Ptosis: A Pooled Analysis of 2 Randomized Clinical Trials. JAMA Ophthalmol. 2020 Nov 1;138(11):1168-1175. doi: 10.1001/jamaophthalmol.2020.3812.
27. Barsegian A, Botwinick A, Reddy HS. The Phenylephrine Test Revisited. Ophthalmic Plast Reconstr Surg. 2018 Mar/Apr;34(2):151-154. doi: 10.1097/IOP.0000000000000903.
28. Ophthalmic Plast Reconstr Surg. 2018 Mar/Apr;34(2):151-154. doi: 10.1097/IOP.0000000000000903.
29. Keene KR, Kan HE, van der Meeren S, Verbist BM, Tannemaat MR, Beenakker JM, Verschuuren JJGM. Clinical and imaging clues to the diagnosis and follow-up of ptosis and ophthalmoparesis. J Cachexia Sarcopenia Muscle. 2022 Dec;13(6):2820-2834. doi: 10.1002/jcsm.13089. Epub 2022 Sep 29.
30. Canepa C, Venu M. Progressive bilateral ophthalmoparesis--a case of simultaneous autoimmunity:

balancing Graves' ophthalmoparesis and ocular myasthenia. BMJ Case Rep. 2016 Jan 4;2016:bcr2015213395. doi: 10.1136/bcr-2015-213395.
31. Akan O, Baysal-Kirac L. Ophthalmologic manifestations in myasthenia gravis: presentation and prognosis. Acta Neurol Belg. 2021 Oct;121(5):1131-1140. doi: 10.1007/s13760-020-01556-3. Epub 2021 Jan 4.