Review

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Comparative Analysis of Anterior vs Posterior Approaches in Eyelid Ptosis Repair

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Eyelid ptosis, characterized by the drooping of the upper eyelid, can significantly impair vision and aesthetics. Surgical repair is often necessary, and the choice between the anterior and posterior approaches is crucial for optimal outcomes. This review compares these two techniques based on efficacy, safety, and recovery. The anterior approach, typically involving an external incision along the eyelid crease, allows direct access to the levator muscle or aponeurosis for resection or advancement. This method is particularly advantageous in cases of aponeurotic ptosis where direct visualization is often necessary. Benefits include enhanced control over eyelid height and contour, with the potential for superior cosmetic outcomes due to hidden incisions. However, the anterior approach carries a higher risk of complications such as hematoma, infection, and scarring, necessitating careful patient selection and surgical expertise. Conversely, the posterior approach, involving an internal incision through the conjunctiva, is less invasive and avoids external scars. This technique is predominantly used for mild to moderate ptosis, especially in patients with preserved levator function. It targets Müller's muscle, which is less traumatic and associated with a shorter recovery time and lower complication rates. The posterior approach is favored for its simplicity and reduced risk profile, though it offers limited visualization and may not be suitable for all ptosis types. In conclusion, both the anterior and posterior approaches to eyelid ptosis repair have distinct advantages and limitations. The choice of technique should be individualized, considering factors such as the severity of ptosis, patient anatomy, desired outcomes, and potential risks. A thorough preoperative assessment and discussion of patient expectations are essential to achieving the best surgical results.

Keywords: lid ptosis; surgical approach; surgical lifting; facial aesthetics; dry eye; lid surgery

Introduction

Eyelid ptosis, commonly referred to as drooping of the upper eyelid, is a condition that can significantly impact both vision and facial aesthetics [1,2]. Defined by the abnormal lowering of the upper eyelid margin, ptosis can occur due to various etiologies, including congenital factors, age-related changes, trauma, or neurological conditions. The prevalence of ptosis increases with age, making it a common concern in older adults, though it can affect individuals of all ages. This condition not only obstructs the visual field, leading to functional impairments such as difficulty in reading or driving, but it also alters the appearance of the face, often causing a tired or aged look [2–5].

The importance of ptosis repair lies in its dual role in restoring both function and appearance. Functionally, surgery aims to elevate the eyelid to a normal position, thereby improving the visual field and reducing the strain on the forehead muscles that often compensate for the drooping lid [6–8]. Cosmetically, ptosis repair associated with a blepharoplasty can rejuvenate the appearance, providing a more youthful and alert look, which is particularly important for patients concerned about their facial aesthetics [8].

Surgically, ptosis can be addressed through either anterior or posterior approaches, each offering distinct advantages depending on the specific characteristics of the ptosis and patient anatomy [9,10]. Both the anterior and poste-

rior approaches can be utilized in eyelid ptosis repair, but the choice of approach usually depends on which muscle is being targeted. When addressing the levator palpebrae superioris muscle, which is located more anteriorly, surgeons typically opt for an anterior incision [11,12]. This approach provides direct access to the levator muscle, allowing for precise resection or advancement. Furthermore, this approach involves an incision that is similar to a blepharoplasty, making the combination of the procedures simple and almost natural. However, this could also lead to the violation of the septum, which, once damaged, may potentially increase the risk of scar retraction [13,14]. Overcorrection is a serious issue in these patients.

On the other hand, the Müller muscle, being part of the posterior lamella of the eyelid, is usually accessed through a posterior approach via a transconjunctival incision. This method allows for a more targeted intervention on the Müller muscle without the need for external incisions [15–17].

While the anterior approach is generally preferred for accessing the levator muscle due to its more anterior location, there are also examples in the literature of using a posterior approach to access the levator muscle, particularly in cases of congenital ptosis. In these instances, the posterior approach may be employed to address specific anatomical considerations or to minimize external scarring. This approach involves making an incision through the conjunctiva, allowing the surgeon to reach and modify the levator muscle from behind the tarsus. This technique is less commonly used but can be particularly effective in certain congenital ptosis cases, where the anatomical configuration may favor a posterior route. Therefore, both anterior and posterior approaches have their place in ptosis surgery, with the choice of method being tailored to the individual patient's needs and the specific characteristics of their ptosis [16,18].

The anterior approach in ptosis repair may result in visible scarring, a longer recovery period, and a higher risk of postoperative lagophthalmos (incomplete eyelid closure). In contrast, the posterior approach, while generally avoiding external incisions, carries a higher risk of undercorrection and may be less effective in cases with poor levator function. Both approaches can lead to dry eye symptoms, particularly in patients with preexisting ocular surface issues [19]. Additionally, given the variety of ptosis types and the anatomical differences in patients, there is uncertainty about which technique yields better long-term functional and cosmetic outcomes in specific cases.

In conducting our review, we performed a detailed literature search on PubMed to identify studies relevant to eyelid ptosis repair. We used a combination of specific keywords and Medical Subject Headings (MeSH) terms to capture a comprehensive range of articles. Our search terms included "ptosis repair", "eyelid surgery", "levator advancement", "Müller's muscle-conjunctival resection", "anterior approach", "posterior approach", "ptosis diagnosis", "dry eye", "complications", "age-related ptosis", and "ptosis surgical outcomes". We further refined our search by combining terms such as "ptosis AND anterior approach", "ptosis AND posterior approach", "levator function AND ptosis", "phenylephrine test AND ptosis", and "margin reflex distance (MRD) AND ptosis". To capture recent developments in the field, we limited our search to articles published in the last 10 years, focusing on clinical outcomes, functional and aesthetic results, age-related factors, dry eye considerations, and potential complications. Only studies published in English were included. This approach enabled us to gather a comprehensive dataset for a thorough comparative analysis of anterior versus posterior approaches in ptosis repair.

This review aims to compare these two approaches, examining their efficacy, safety, and patient outcomes, to guide clinicians in selecting the most appropriate technique for individual patients.

Preoperative Assessment

Preoperative assessment of eyelid ptosis is a crucial step in planning an effective surgical intervention. This evaluation begins with a comprehensive patient history, including the onset, duration, and progression of the ptosis, as well as any associated symptoms such as visual impairment, fatigue, or headaches. The surgeon should also inquire about any history of ocular or systemic diseases, previous eye surgeries, or use of medications that might affect eyelid function [20–22].

A thorough clinical examination follows, focusing on the degree of ptosis, levator muscle function, and eyelid crease position. The MRD is measured to quantify the degree of ptosis. Levator function is assessed by measuring the eyelid's excursion from downgaze to upgaze, which helps determine the appropriate surgical approach. Additionally, the integrity of the eyelid's structural components, such as the tarsus, orbital septum, and Müller's muscle, is evaluated [2,23–26].

Special tests like the phenylephrine test can be used to assess the function of Müller's muscle and predict the potential success of a posterior approach or Müllerectomy. In this test, a 2.5% to 10% phenylephrine solution is instilled into the eye; a positive response, characterized by significant temporary eyelid elevation, suggests that the patient may benefit from a Müllerectomy [17,27].

Finally, the surgeon should assess the patient's tear film and ocular surface to identify any preexisting dry eye syndrome, as ptosis surgery can exacerbate this condition, particularly in elderly people [28–31]. Detailed preoperative documentation, including photographs, is essential for surgical planning and for setting realistic expectations with the patient. Table 1 summarizes the preoperative assessment. It would be beneficial for clinicians to base treatment

Table 1. Preoperative assessment.

Assessment component	Details	Purpose
Patient history	- Onset, duration, and progression of ptosis - Symptoms: visual impairment, fatigue - Ocular/systemic diseases - Previous surgeries, medication use	- Understand ptosis etiology - Identify factors influencing surgical planning
Clinical examination	- Degree of ptosis (MRD) - Levator muscle function (eyelid excursion) - Eyelid crease position - Eyelid structural components (tarsus, septum, Müller's muscle)	- Quantify ptosis severity - Determine the surgical approach - Assess anatomical structures
Special tests	- Phenylephrine test (2.5%–10%)	- Evaluate Müller's muscle function - Predict the success of posterior approach/Müllerectomy
Tear film and ocular surface	- Assessment of tear production and quality - Identification of preexisting dry eye syndrome	- Prevent exacerbation of dry eye post-surgery - Plan postoperative care
Preoperative documentation	- Detailed photographs of eyelid position and function	- Aid in surgical planning - Establish a baseline for postoperative comparison

MRD, margin reflex distance.

choices on specific assessments to optimize ptosis management, especially in complex cases. For example, using the phenylephrine test can help determine if Müller's muscle-conjunctival resection is a suitable option, as a positive response suggests that elevating the eyelid through this muscle may be effective. Similarly, measuring the MRD provides critical information about eyelid positioning, helping to guide decisions on the type and extent of surgical intervention needed. By systematically incorporating these assessments into the decision-making process, clinicians can tailor treatment to the patient's unique presentation, potentially improving outcomes in cases where general guidelines are limited [19].

It would be beneficial for clinicians to base treatment choices on specific assessments to optimize ptosis management, especially in complex cases. For example, using the phenylephrine test can help determine if Müller's muscle-conjunctival resection is a suitable option, as a positive response suggests that elevating the eyelid through this muscle may be effective. Similarly, measuring the MRD provides critical information about eyelid positioning, helping to guide decisions on the type and extent of surgical intervention needed. By systematically incorporating these assessments into the decision-making process, clinicians can tailor treatment to the patient's unique presentation, potentially improving outcomes in cases where general guidelines are limited [19].

The age of the patient considerably affects the outcomes of ptosis correction due to variations in tissue elasticity, muscle function, and the likelihood of dry eye, all of which are age-dependent factors [28,32]. Patients of a younger demographic typically demonstrate more robust tissue, rendering them appropriate candidates for either method contingent upon the severity of ptosis. In elderly individuals, however, age-associated tissue laxity and an increased incidence of dry eye disease require meticulous evaluation [33]. Quantitative outcome measurements, such as alterations in margin reflex distance (MRD) and levator function pre- and post-surgery, offer a consistent approach for evaluating surgical outcomes across various age demographics [20,34].

Anterior Approach to Eyelid Ptosis Repair

Surgical Techniques

The anterior approach to eyelid ptosis repair is a widely utilized technique, particularly suited for cases where direct access to the levator muscle or its aponeurosis is necessary. This approach involves making an external incision, typically along the natural crease of the upper eyelid, providing direct visualization of the underlying structures [35–37]. The procedure allows for precise dissection and manipulation of the levator muscle, which is often resected, advanced, or tightened to achieve the desired elevation of the eyelid [12]. While a Müller muscle-conjunctival resection can technically be performed using an anterior approach, it makes little sense to do so given that the Müller muscle is part of the posterior lamella. Therefore, this approach is typically reserved for cases where Müller muscle resection is combined with levator surgery, such as in severe ptosis or Graves' disease [38]. In these situations, both the levator muscle and Müller muscle may need modification to achieve the desired eyelid position [39]. The surgical procedure is shown in Fig. 1.

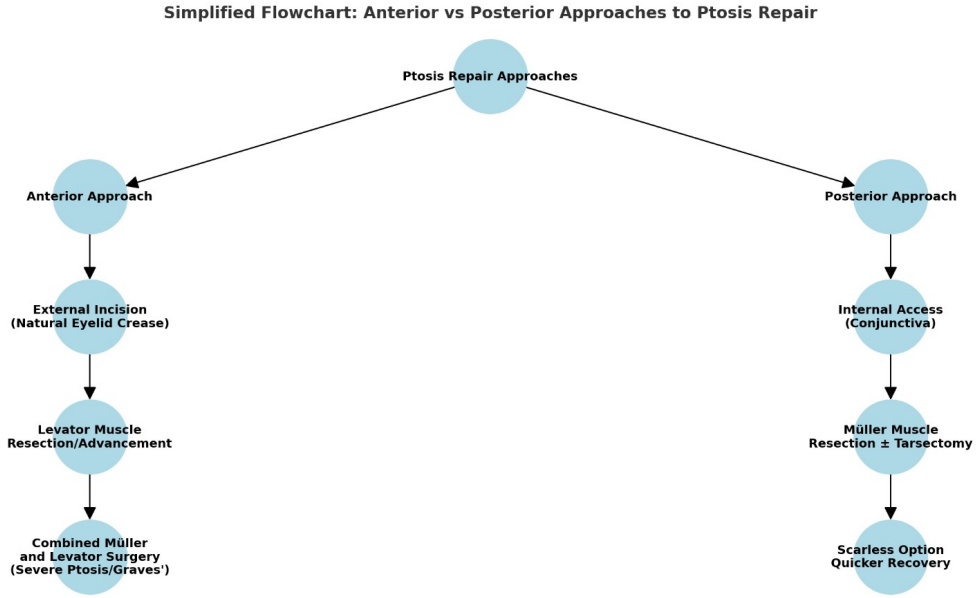

Fig. 1. Schematic flowchart of the surgical approaches. Created by PowerPoint 2021.

Indications

The anterior approach in ptosis repair can be evaluated using the phenylephrine 0.05% test. This test is used to determine the response of the Müller muscle to phenylephrine, a sympathomimetic agent that causes temporary contraction of the muscle, thereby lifting the upper eyelid.

- **Aponeurotic (Involutional) Ptosis**: The anterior approach is particularly indicated in cases of aponeurotic ptosis, where there is a weakening or dehiscence of the levator muscle aponeurosis. This condition is often seen in elderly patients or individuals who have experienced trauma or undergone previous ocular surgery [40,41].
- **Negative Response to the Phenylephrine 0.05% Test**: When the phenylephrine test does not produce significant eyelid elevation (indicating a poor response of the Müller muscle), it is likely that the primary issue lies with the levator muscle or its aponeurosis. In such cases, the anterior approach is preferred to allow for resection or advancement of the levator muscle [2].
- **Moderate to Severe Ptosis**: In patients with moderate to severe ptosis, where a significant elevation of the eyelid is required, the anterior approach offers greater control over the height and contour of the eyelid, making it more appropriate than other less invasive techniques.
- **Combined Blepharoplasty**: whenever an aesthetic procedure is associated an anterior approach is suggested [7,8,41].

Advantages

One of the primary advantages of the anterior approach is the accessibility and visibility it provides. The external incision allows the surgeon to directly view and manipulate the levator muscle and aponeurosis, enabling more precise adjustments. This visibility is particularly beneficial when dealing with complex or severe cases of ptosis, where the degree of correction must be meticulously controlled. The anterior approach also offers the potential for good cosmetic outcomes, as the incision is placed within the natural crease of the eyelid, minimizing visible scarring [9,11,12,42]. Moreover, it may be easily combined with a blepharoplasty procedure [43].

Disadvantages

Despite its advantages, the anterior approach comes with certain disadvantages. The external incision, while strategically placed, carries a risk of scarring, which can be a concern for patients focused on cosmetic outcomes. Additionally, this approach often requires a longer recovery period compared to less invasive techniques, with the potential for postoperative swelling, bruising, and discomfort [9]. The technical challenges associated with the anterior approach also necessitate a high level of surgical expertise, particularly in ensuring that the correct degree of eyelid elevation is achieved without overcorrection or undercorrection. Furthermore, complications such as hematoma, infection, and asymmetry are risks that must be carefully managed through meticulous surgical planning and execution [12,44].

Posterior Approach to Eyelid Ptosis Repair

Surgical Techniques

The posterior approach to eyelid ptosis repair is a less invasive alternative that avoids external incisions, focusing instead on internal access through the conjunctiva. This ap-

proach is particularly well-suited for addressing ptosis by targeting the Müller muscle, a thin muscle that contributes to eyelid elevation [27,45,46]. The most common technique in this approach is the Müller muscle resection, where a portion of the Müller muscle is excised to create a mild to moderate lift of the eyelid. Müller muscle resection can also be performed without the final suturing step. This approach has been found to be equally effective and may make the procedure even quicker [47]. To enhance the effectiveness of Müller muscle resection, a tarsectomy can be added to the standard procedure. However, it's crucial to ensure that only a conservative portion of the tarsus is removed, as it is one of the key structures responsible for maintaining the stability of the upper eyelid [48–50]. The literature on this topic is still controversial. Most oculoplastic surgeons have now largely abandoned tarsectomy, favoring instead a levator resection via an anterior approach or a combined levator and Müller resection surgery [50,51].

In addition to these techniques, the posterior approach can also be utilized in the setting of levator muscle surgery. Although less common, this method involves accessing the levator muscle through a conjunctival incision, allowing for modification of the levator muscle without the need for external cuts. This technique may be chosen to reduce scarring when the surgeon deems it beneficial based on the patient's specific anatomical considerations.

Furthermore, for some women who prefer or do not need to combine ptosis correction with a blepharoplasty, the option of a "scarless" solution can be highly appealing. By minimizing tissue disruption and avoiding external incisions, the posterior approach offers a cosmetically favorable option, providing effective ptosis correction with potentially quicker recovery and a reduced risk of visible scarring [9].

Indications

The posterior approach in ptosis repair is a minimally invasive technique that is particularly effective in certain patient profiles and specific types of ptosis. The use of the phenylephrine 0.05% test plays a crucial role in determining the suitability of this approach.

- **Positive Response to the Phenylephrine 0.05% Test**: A positive response to the phenylephrine test, where the application of the drug results in noticeable elevation of the eyelid, indicates good function of the Müller muscle. In such cases, the posterior approach is ideal as it directly targets the Müller muscle through a conjunctival incision, allowing for its resection to achieve the desired lift.
- **Mild to Moderate Ptosis**: The posterior approach is particularly suited for patients with mild to moderate ptosis, where the primary issue lies with the Müller muscle rather than the levator muscle. This approach provides an effective solution without the need for more invasive external incisions [2,11,52].
- **Patients Preferring a "Scarless" Solution**: Some patients, particularly women who do not wish to combine ptosis correction with a blepharoplasty, may prefer a surgical option that avoids external scars. The posterior approach, being entirely internal, offers a cosmetically favorable "scarless" alternative that is highly appealing to those concerned about visible scarring [9].
- **Congenital Ptosis With Specific Anatomical Considerations**: In certain cases of congenital ptosis, the posterior approach may be used to access the levator muscle through the conjunctiva. This method, though less common, is chosen when it is deemed advantageous based on the patient's unique anatomical features, providing a less invasive option with reduced risk of external scarring [3,49].
- **Revision of Anterior Approach Levator Muscle Advancement/Resection**: In some patients, after an initial anterior ptosis correction procedure, a slight residual ptosis may remain. This can potentially be addressed with a posterior approach [53].

Advantages

One of the key advantages of the posterior approach is its minimally invasive nature. By accessing the eyelid structures through the conjunctiva, this technique avoids external scarring, which is a significant cosmetic benefit for patients concerned about visible signs of surgery [27,51]. The internal approach also tends to result in a shorter recovery time, with less postoperative swelling and bruising compared to the anterior approach. Additionally, because the surgery involves less tissue disruption, the risk of complications such as infection or hematoma is generally lower, making this approach appealing to patients seeking a low-risk procedure [9,12]. Moreover, the most important benefit consists of lower overcorrection and retraction [54].

Disadvantages

Despite its benefits, the posterior approach has some limitations. The internal access through the conjunctiva provides limited visibility and direct access to the levator muscle, making it more challenging to perform precise adjustments [9,18]. This restricted view can be a disadvantage in cases where the ptosis is severe or where more extensive correction is needed, as it may be difficult to achieve the desired outcome without external visualization. The technique also requires a high degree of skill and experience, particularly in accurately resecting the Müller muscle or advancing the conjunctiva without compromising the function or causing asymmetry. Additionally, the posterior approach may not be suitable for all types of ptosis, particularly those requiring significant structural changes or where levator function is severely compromised [2,12].

Complications and Risks

Complications related to each method differ based on surgical technique and patient characteristics. The anterior technique, while offering direct access for accurate adjustment, entails an increased risk of scarring, asymmetry, and dry eye syndrome due to its intrusive characteristics. The posterior technique, which eliminates exterior incisions, is linked to less apparent scarring and postoperative dry eye; however, it may result in undercorrection in instances necessitating significant elevation. Recent studies provide evidence of these risk profiles, assisting doctors in determining the best appropriate treatment according to patient-specific hazards. The incidence and types of complications vary between the two approaches. The anterior approach, due to its external incision and more extensive tissue manipulation, carries a higher risk of complications such as scarring, hematoma, infection, and potential asymmetry. These complications, while generally manageable, necessitate careful patient selection and surgical expertise [12,46]. The posterior approach, being less invasive, has a lower incidence of complications, with common issues including conjunctival irritation or insufficient correction. However, the risk of undercorrection is a notable concern with the posterior approach, particularly in more severe cases of ptosis [15,17].

Ptosis Repair and Dry Eye

An important consideration in ptosis repair is its potential impact on dry eye syndrome (DES), a condition characterized by insufficient tear production or poor tear quality leading to an inflammatory vicious cycle with an autoimmune basis [55–57]. The choice of surgical approach—anterior or posterior—can significantly influence dry eye outcomes [58]. This chapter explores how each approach affects dry eye symptoms and provides insights into optimizing surgical outcomes [59,60].

Impact of the Anterior Approach on Dry Eye

The anterior approach to ptosis repair involves an external incision along the eyelid crease. It may be comparable or even worse to a blepharoplasty procedure regarding its impact on dry eye [61–63]. Therefore, it can have notable implications for this pathology:

- Scarring and Blinking: The external incision may cause scarring, which can interfere with normal eyelid closure and blinking. Effective blinking is crucial for tear film distribution, and any compromise in blinking mechanics can exacerbate dry eye symptoms [64].
- Postoperative Inflammation: The surgical trauma from the anterior approach can lead to inflammation in the eyelid and surrounding tissues. This inflammation can further disrupt tear production and contribute to dry eye issues [30,65].

Impact of the Posterior Approach on Dry Eye

The posterior approach involves an internal incision through the conjunctiva, targeting structures such as the Müller muscle. This method is less invasive compared to the anterior approach and generally results in:

- Minimized External Disruption: by avoiding external incisions, the posterior approach reduces visible scarring and maintains the integrity of the eyelid's external anatomy. This can help preserve normal blinking and tear film stability.
- Reduced Invasiveness: The internal nature of this approach typically results in less surgical trauma, potentially leading to fewer postoperative dry eye symptoms. However, the extent of Müller muscle resection can still impact tear film stability, though generally less so than with the anterior approach.

Comparative Considerations

Comparative studies on the impact of anterior versus posterior approaches on dry eye are lacking. However, existing evidence suggests that the posterior approach may result in fewer dry eye complications due to its reduced invasiveness and minimized external disruption, in particular, if the procedure is conjunctiva-sparing and sutureless [66,67]. The choice of approach should consider the severity of ptosis, the need for precise correction, and the patient's preoperative tear film status.

Recommendations for Minimizing Dry Eye

- Preoperative Assessment: Assess tear film quality and ocular surface health prior to surgery. This evaluation helps identify patients at higher risk for developing dry eye complications, such as elderly people, and patients with other comorbidities like floppy eyelid syndrome or systemic diseases (diabetes, thyroid dysfunction, menopause in women, other inflammatory conditions affecting the ocular surface) [28,38,68–74].
- Intraoperative Techniques: For the anterior approach, use smaller incisions and handle tissues with care to minimize trauma. For the posterior approach, ensure adequate but conservative resection of the Müller muscle to balance eyelid elevation with tear film stability [75].
- Postoperative Care: Monitor patients for dry eye symptoms and provide artificial tears or anti-inflammatory treatments as needed. Early intervention can help manage symptoms and improve patient comfort [76–78].

The choice between anterior and posterior approaches in ptosis repair can significantly impact dry eye outcomes. The anterior approach, while effective for severe ptosis, may lead to increased dry eye symptoms due to scarring and inflammation. In contrast, the posterior approach offers a less invasive alternative, potentially reducing the risk of dry eye complications. Tailoring the surgical approach to indi-

vidual patient needs and carefully managing postoperative care are essential for optimizing outcomes and minimizing dry eye issues.

Recovery and Downtime

Recovery time and postoperative care requirements also differ between the two approaches. The anterior approach typically involves a longer recovery period, with patients experiencing more swelling, bruising, and discomfort postoperatively [9,79,80]. The need for careful wound care and follow-up is more pronounced, and the overall downtime can be extended compared to the posterior approach. In contrast, the posterior approach is associated with a shorter recovery time, with less noticeable postoperative symptoms and quicker return to normal activities [27,66,80]. The internal nature of the procedure minimizes the need for extensive wound care, and patients often appreciate the reduced downtime.

Limitations of Current Research

While existing research provides valuable insights, there are notable gaps in the literature that need to be addressed. Many studies focus primarily on short-term outcomes, with less emphasis on long-term efficacy and recurrence rates. Additionally, the majority of comparative studies lack standardized outcome measures, making it difficult to directly compare results across different studies [9,12]. There is also a need for more randomized controlled trials that compare the two approaches across diverse patient populations to better understand how factors such as age, comorbidities, and previous surgeries affect outcomes. These gaps highlight the importance of further investigation to refine surgical techniques and improve patient selection criteria [81].

Recommendations for Surgeons

Based on the current evidence, surgeons should adopt a patient-centered approach when selecting the appropriate technique for ptosis repair. Best practices include conducting a thorough preoperative assessment to evaluate the type and severity of ptosis, as well as considering the patient's aesthetic and functional goals. For patients with severe ptosis or cases requiring significant structural correction, the anterior approach may be more appropriate, provided that the surgeon has the expertise to manage the potential complications [9,11,37]. On the other hand, the posterior approach should be considered for patients with mild to moderate ptosis who prioritize a minimally invasive procedure with minimal scarring and quicker recovery. Surgeons should also remain aware of the limitations in the current literature and continue to contribute to the body of research by reporting outcomes and sharing clinical experiences [27,66,80].

Surgeons should examine other criteria beyond the severity of ptosis and the invasiveness of the procedure to deliver a customized strategy for ptosis surgery. A thorough decision-making method encompasses diagnostic testing, individualized anatomical considerations, and aesthetic objectives. We delineate a multi-faceted methodology for directing personalized treatment planning:

- Diagnostic Testing and Evaluation

Phenylephrine 0.05% Assessment: This assessment is essential for evaluating the appropriateness of a posterior strategy. A favorable reaction, wherein the administration of phenylephrine raises the eyelid, signifies effective Müller muscle function, supporting a posterior approach. A negative response indicates primary levator dysfunction, for which the anterior approach is more suitable.

- Assessment of Levator Muscle Function

Evaluating the levator function is essential for distinguishing instances that would benefit from one technique over another. The anterior approach is typically used for patients with impaired levator function, particularly in situations of moderate to severe ptosis that necessitate direct access for best management.

- Age and Ocular Surface

Age-related considerations substantially affect the choice of strategy, especially in older people with compromised tear film quality and an increased risk of dry eye. The posterior approach is advised for elderly patients to minimize the risk of dry eye problems, owing to its least invasive characteristics. Younger patients, with generally more resilient tissue, may gain advantages from either method depending on functional needs and aesthetic preferences.

- Patient Priorities and Aesthetic Considerations

The selection of technique should be informed by patient preferences for visible scarring and recovery duration. For patients prioritizing a "scarless" treatment or expedited recovery, the posterior technique presents a cosmetically advantageous alternative. Alternatively, for those necessitating simultaneous ptosis correction and blepharoplasty, the anterior approach may be warranted due to the complementary nature of both surgeries.

Future Directions

Looking ahead, emerging techniques and technologies hold promise for further enhancing the outcomes of ptosis repair. Advances in imaging and diagnostic tools may improve preoperative planning, allowing for more precise customization of surgical techniques to individual patient anatomy. Additionally, the development of less invasive methods, such as laser-assisted procedures or refined suture techniques could offer alternatives that combine the benefits of both the anterior and posterior approaches. Ongoing research into the long-term efficacy and safety of

these techniques will be crucial in guiding future clinical practice. Moreover, the use of novel approaches using the anti-inflammatory and regenerative capacity of stem cells shows promise in enhancing the management of oculoplastic surgery [82]. As the field evolves, a continued emphasis on patient-centered care and the refinement of surgical methods will be essential in achieving optimal outcomes in eyelid ptosis repair.

Conclusion

This review has highlighted the strengths and limitations of both the anterior and posterior approaches to eyelid ptosis repair. The anterior approach, with its direct access to the levator muscle, is particularly effective for moderate to severe ptosis, offering precise control over eyelid elevation and contour. However, it carries a higher risk of complications and requires a longer recovery period. The posterior approach, on the other hand, is minimally invasive, avoids external scarring, and is associated with fewer complications and quicker recovery times, making it an ideal choice for patients with mild to moderate ptosis and good levator function. The choice between these approaches should be individualized based on patient characteristics, the severity of ptosis, and the surgeon's expertise.

Availability of Data and Materials

Not applicable.

Author Contributions

Conceptualization, AS, PLS, MZ, PCP; methodology, AS, PLS, VC, CG, PCP, FDE, GGC; software, AS, PLS; validation, AS, MM, PLS, PCP, FDE; formal analysis, AS, CG; investigation, MZ; resources, AS, FDE, PCP, GGC; data curation, AS, PLS; writing—original draft preparation, MZ, VC, PLS, GGC, PCP, FDE, MM, CG, AS; writing—critical review and editing, MZ, VC, PLS, GGC, PCP, FDE, MM, CG, AS; visualization, GGC, PCP, CG; supervision, PCP, FDE; project administration, MZ, MM, PCP. All authors have read and agreed to the published version of the manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

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Conflict of Interest

The authors declare no conflict of interest.

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