

Surgical Approaches to the Infraorbital Rim and Orbital Floor: The Case for the Subtarsal Approach

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A variety of surgical approaches to the orbital floor and infraorbital rim exist and can be conveniently categorized as either transcutaneous or transconjunctival. These approaches are widely used for exposure, evaluation, and treatment of orbital trauma, pathology, and cosmesis. While we use both methods, we feel there are advantages of each depending on the surgical plan. For purposes of this article, we will assume that the infraorbital rim and/or floor of the orbit require exposure. We admit that transcutaneous approaches to the orbit may be less useful than the transconjunctival approach when access to the medial wall of the orbit is required. Nevertheless, we contend that both transcutaneous and transconjunctival approaches can be used for access to the orbital floor and infraorbital rim, and it is for such access that we base the following argument.

What Are the Transcutaneous Approaches and How Do They Differ?

The subciliary, subtarsal, and infraorbital incisions are collectively considered the transcutaneous approaches to the orbital floor and infraorbital rim. The subciliary, or blepharoplasty incision, is made approximately 2 mm inferior to, and parallel with, the superior free margin of the lower lid. It extends from the medial canthal region into or parallel to one of the resting skin tension lines located along the lateral aspect of the orbit, which usually turn slightly inferiorly. Once the incision has been made, the dissection can be made 1 of 2 ways depending on the path of

dissection through the orbicularis oculi muscle. With the skin-only technique the dissection is entirely between the skin and orbicularis muscle to the level of the infraorbital rim. The skin-muscle technique differs in that the flap is made by dissecting through the orbicularis muscle either initially, or in a stepped manner, first dissecting the skin for several millimeters before penetrating the orbicularis oculi muscle. Both of these approaches preserve the position of the pretarsal orbicularis oculi muscle. However, when the skin and orbicularis muscle are incised coincidentally, no orbicularis oculi muscle is left attached to the inferior tarsus. With either method, once the orbital rim is reached, an incision through the periosteum is made and subperiosteal dissection exposes the orbital region of interest.

The subtarsal (also known as mid-lid) approach was popularized by John Converse.¹ The incision is made 5 to 7 mm inferior to the lower lid margin, in one of the subtarsal creases, and extends laterally into (or parallel to) one of the resting skin tension lines located along the lateral aspect of the orbit. Following the initial incision through skin and orbicularis oculi, a preseptal dissection is carried to the level of the orbital rim and the periosteum just below the infraorbital rim is incised to reveal the orbital floor and infraorbital rim. This approach maintains a band of pretarsal orbicularis muscle as well as its innervation on the tarsus. With the third transcutaneous approach, known as the infraorbital incision, the skin, orbicularis oculi muscle, and periosteum are incised coincidentally. This approach, relative to the other transcutaneous approaches, provides the quickest and most direct route to the orbital rim and floor.²

What Are the Advantages of One Transcutaneous Approach Over Another?

Today, it is rare that a surgeon would use an incision along the infraorbital rim because of the visible scar, so we will not address this approach any further. Rather, we will compare the subciliary and subtarsal

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approaches. From the standpoint of access, there is little difference in the exposure one can gain with either method. The question that must be answered is: how do these approaches compare with regard to ease of surgery and postoperative complications?

While there is no literature comparing the difficulty of performing the subciliary and subtarsal approaches, years of experience in the operating room teaching residents has made it clear to the senior author that the subciliary approach, including the incision, dissection, and closure, is the more demanding approach. There are several reasons for this. First, the eyelashes have to be carefully retracted to prevent incising them, whereas this is unnecessary with the subtarsal approach. Second, with the stepped skin-muscle subciliary approach, the thin eyelid skin must be carefully and gently dissected from the underlying pre-tarsal orbicularis oculi muscle. This is not only difficult but also unnecessary with the subtarsal approach. Third, closure can be more difficult because of irregularities in levels that can arise from the stepped incision and from avoiding the eyelashes. For all these reasons, the subtarsal approach is much simpler for most surgeons. Holtmann et al³ confirmed these impressions by showing longer operating times with the subciliary versus the mid-lid approach to the orbit. They found that the subciliary approach took almost twice as long to perform.

There have been several investigations comparing the various transcutaneous approaches. The rate of postsurgical scleral-show and/or ectropion for subciliary approaches ranges from 16.6%⁴ to 42%⁵ in the literature.^{2,6-8} In contrast, the rate of scleral-show and/or ectropion for subtarsal approaches has been reported to be much less, ranging from 2.7%³ to 7.7%.² The rate of perceiving a noticeable scar was reported slightly higher for the subtarsal approach when compared with the subciliary approach (2.2% vs none).² Another study showed that the scar from the subtarsal approach is barely visible.³ In balance, this rate of a noticeable scar is quite acceptable when compared with the rates of scleral-show and/or ectropion with the subciliary approach.

In general, it can be summarized that the lower the incision is made on the eyelid, the lower the risk of scleral-show and/or ectropion, but the more noticeable the scar. Therefore, we believe the optimal transcutaneous approach should be as near the eyelid margin as possible to minimize scarring but far away enough to minimize scleral-show and ectropion. A subtarsal approach with a postoperative Frost suture will mitigate the scleral show and/or ectropion and capitalize on the benefits,^{2,7} making it a reasonable compromise.

How Does the Subtarsal Approach Compare With the Transconjunctival Approach?

Unfortunately, most studies comparing transcutaneous and transconjunctival approaches for access to the orbital floor and/or infraorbital rim compare the subciliary approach rather than the subtarsal. Not surprisingly, most of these investigations have shown that the subciliary approach has higher rates of scleral-show and/or ectropion than the transconjunctival.^{3,5,8,9} However, if we use the rates of scleral-show and/or ectropion for the subtarsal approach cited in the above studies, the rates of eyelid deformity are similar to those seen with the transconjunctival approach.

For instance, Appling et al⁸ performed 33 transconjunctival approaches and found 3% developed scleral-show, 9% had canthal malposition, and all patients experienced several weeks of chemosis. Wray et al⁵ reviewed 45 transconjunctival approaches used for orbital fractures. They found 1 eyelid had temporary entropion and 1 lid was lacerated from traction placed on the lid during the approach. Patel et al⁹ retrospectively evaluated 30 transconjunctival approaches for orbital fracture treatment. The transconjunctival groups' postoperative complications include 1 case each of the following: increased scleral-show, pyogenic granuloma, and lower lid laceration.

Netscher et al¹⁰ performed lower lid blepharoplasties on 10 patients whose eyelids were not morphologically prone to ectropion. Each patient had non-stepped, skin-muscle subciliary approach on the left and transconjunctival approach on the right. There was no significant difference in the amount of scleral-show between the two sides, nor was there any difference in fornix depth. Additionally, there was no perceptible scar difference from 1 side to the other.

If the incidence of eyelid problems is approximately the same using either the subtarsal or the transconjunctival approach, what other factors are involved in making the decision to use one approach over the other? Two important interrelated factors should be considered: 1) the amount of surgical exposure provided, and 2) the ease of performing the approach.

The transconjunctival method provides very limited exposure of the orbit unless accompanied by a lateral canthotomy and inferior cantholysis. Wray et al⁵ found that the access to the orbital rim and floor obtained on 25 of 45 transconjunctival approaches was inadequate and required lateral canthotomy. Similarly, Holtmann et al,³ comparing transcutaneous and transconjunctival approaches, stated "fracture exposure was adequate with all but conjunctival incisions; lateral canthotomy was added in 56% of cases to

improve exposure." Patel et al⁹ performed 25 lateral canthotomies in 30 patients to obtain adequate exposure of the fracture.

It is an accepted fact that when combined with a lateral canthotomy, exposure of the orbital floor and/or infraorbital rim is good with the transconjunctival approach. However, the addition of a lateral canthotomy significantly complicates the approach because the inferior canthus has to be properly resuspended during closure to prevent eyelid malpositions. In fact, the reattachment of the inferior canthus is perhaps the most exacting and difficult part of the entire approach. Most oral and maxillofacial surgeons are more comfortable closing a skin incision rather than reattaching the inferior canthus. Transcutaneous approaches obviate the need not only for a canthotomy but also the difficult canthal reattachment that can result in canthal malposition. When one needs to approach a fracture located more medially along the infraorbital rim, such as a fracture through the frontal process of the maxilla in a naso-orbito-ethmoid fracture, the subtarsal incision provides better exposure than the transconjunctival approach. The incision can be extended medially as far as necessary to provide such access. Approaching this same fracture from a transconjunctival approach is almost impossible because of the presence of the lacrimal sac, which prevents the retraction necessary to reach such a fracture.

A significant advantage of the subtarsal approach is its simplicity. With direct visualization, the anatomy of the lower lid and orbit are easily identified during dissection, treatment, and closure. In contrast to ophthalmologists, most oral and maxillofacial surgeons have a higher comfort level operating on the dermal surface of the eyelid rather than behind it on the conjunctival surface. The transconjunctival approach requires retraction and manipulation of the conjunctival surfaces, making the ocular globe more susceptible to injury. Appling et al⁸ suggested that for surgery on an orbit that contains the only seeing eye, one should avoid the transconjunctival approach because the risk to the globe may be higher than when a transcutaneous approach is used, especially for the less experienced surgeon. The capsulopalpebral ligament and inferior tarsal muscle retractors are left intact and undisturbed with the subtarsal approach. The conjunctiva is a profoundly unique tissue that has few acceptable substitutes for repair and reconstruction. The transcutaneous approaches avoid the conjunctiva as well as potential conjunctival complications including granulomas, cysts, rents, and cicatricial scarring.¹² Treatment of such complications is less familiar to the oral and maxillofacial surgeon than are complications that might occur on the dermal surface. Injury to vital adjacent structures,

such as lid lacerations and lacrimal system damage, are more easily avoided with a subtarsal approach.¹² Additionally, a temporary tarsorrhaphy keeps the anterior surface of the globe out of the surgical field so its injury is less likely. Holtmann et al³ confirmed these impressions by demonstrating longer operating times with the transconjunctival versus the dermal approaches to the orbit. The transconjunctival approach took almost 3 times longer to perform.

In the only study that truly compared the use of the subtarsal and transconjunctival approaches for treating facial injuries, Holtmann et al³ concluded that the lower eyelid incision provided a more rapid, direct approach to orbital floor and infraorbital rim fractures with minimal morbidity. Because the scars were as acceptable as subciliary and combined conjunctival-lateral canthotomy scars, they recommend the use of the subtarsal (mid-lid) approach. John Converse was an invited discussant for this article and agreed with those conclusions.¹¹ He felt that the transconjunctival approach is unnecessarily complicated and causes postoperative shortening of the eyelid.

From studies on blepharoplasties, it has been stated in the literature that transcutaneous skin-muscle flap approaches have the advantages of familiar anatomic relationships, less chance of globe or corneal injury, and less direct risk to the deeper orbital structures.¹³⁻¹⁵

Discussion

Because the sole purpose for the inferior orbital surgical approaches is treatment, the approach selected should enable the surgeon to visualize the entire area of interest. The transcutaneous incision provides the surgeon with the latitude to extend the exposure as laterally as is necessary without infringement on the lateral canthal ligament. Moreover, the medial access to the frontal process of the maxilla and nasal bones can also be readily achieved. Proponents of the conjunctival approach would suggest that this approach offers the similar extension option. However, on the basis of their randomized, prospective study involving the transcutaneous and transconjunctival approaches, Holtmann et al³ argue that lateral canthotomy offers adequate surgical exposure but, by encroaching on the skin, defeats the main purpose for which it was conceived, concealing the scar. Additionally, because the lateral canthotomy is frequently used during a transconjunctival approach (56% to 83%),^{3,5,9} one must consider this as a likely outcome of the procedure. Although a transcutaneous approach guarantees a skin incision, with the subtarsal position the scar can be predictably concealed.

Given that all approaches have the potential for postoperative sequelae, the approach selection must

balance perioperative risks with the requirements of treatment. The approach must also be based, in part, on the ability of the surgeon to not only perform the approach but also complications that might result. Neither the transconjunctival nor the transcutaneous approaches are immune from complications. Oral and maxillofacial surgeons are more likely to be able to manage complications from the subtarsal approach, such as scleral-show, ectropion, and/or hypertrophic scar formation better than they might manage complications from the transconjunctival approach, such as lid malposition, entropion, scleral-show, ectropion, and conjunctival granulomas.

These facts should not be a condemnation of the transconjunctival approach; we frequently use this approach and find it useful in the treatment of various maladies of the orbit. For instance, it provides superb access to the medial wall of the orbit. However, for the average oral and maxillofacial surgeon who treats orbital injuries infrequently, the subtarsal approach will prove to be a better choice when access to the infraorbital rim and/or orbital floor is needed. It is simple, predictable, effective, and safe.

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