**Review Article**

**Review of complications in double eyelid surgery**

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Double eyelid surgery is popular worldwide, especially in East Asia. Although double eyelid surgery seems simple, it comes with numerous complications. These complications can be divided into disordered complications and esthetic complications. Plastic surgeons pay more attention to the esthetic aspect. In our long-term clinical work, we have repeatedly observed that many patients with overactive facial muscles (frontalis muscle or corrugator supercilii muscle) often develop esthetic complications after surgery. These patients present with an appearance of a double eyelid fold that is either too high, too low, or absent. However, some plastic surgeons have not realized this, and most of them believe that esthetic complications are caused by improper techniques during surgery. Therefore, it is necessary for us to share our experience in this field with our peers.

**Key words:** Blepharoplasty, complications, double eyelid surgery, facial muscles

Double eyelid refers to the formation of a crease in the upper eyelid skin when the eye is open and when the levator palpebrae superioris muscle contracts. Double eyelid surgery aims to make a stable and effective adhesion between the levator palpebrae superioris muscle and the upper eyelid skin, so that the upper eyelid can form a crease when opening the eye.[11,12] Double eyelid surgery is an extremely common plastic surgery worldwide.[9,10] It is named differently in different regions. In Europe and the United States, it is called “upper blepharoplasty,” while in East Asia, it is often called “double eyelid surgery.” We believe that double eyelid surgery is popular for two reasons: (a) the periorbital region is an important cosmetic unit, and double eyelid surgery can make people look younger and more energetic[13,14] and (b) Mongoloid eyes, more frequent in Asians than in Caucasians, are characterized by a single eyelid, shorter palpebral fissure, and epicanthus. A double eyelid surgery, in such cases, can improve the palpebral fissure and improve the esthetics of the eyes.[13,14]

Although double eyelid surgery is not difficult, postoperative complications are common. We believe that the surgeon’s lack of understanding of the upper eyelid anatomy, improper preoperative design or intraoperative actions, and the adverse effects of patient factors may all contribute to postoperative complications.

**Upper Eyelid Anatomy**

The upper eyelid has three lamellae: The anterior lamella includes the skin and the orbicularis oculi muscle, the middle lamella consists of the orbital septum and preaponeurotic fat, and the posterior lamella includes the tarsal plate, levator palpebrae superioris muscle, Müller’s muscle, and conjunctiva. The levator palpebrae superioris and Müller’s muscles attach to the tarsal plate and work together to lift the upper eyelid to open the eye.[11,15-20] Most Caucasians have congenital double eyelids, while a large proportion of East Asians do not. Through autopsy studies, some scholars have found that East Asians—with single eyelids—had an ineffective connection between the levator palpebrae superioris muscle and the upper eyelid skin, and that they also had lower orbital septum and thicker orbicularis oculi muscle—the main factors hindering the formation of the connection—than Caucasians.[21,22] Moreover, other studies have identified the upper margin of the tarsal plate as the area with the densest connection between the levator aponeurosis and skin in Caucasians with a double eyelid.[23] Therefore, the double eyelid height is usually determined by the tarsal plate height in Caucasians; but this rule cannot be applied to East Asians.

**Complications of Double Eyelid Surgery**

In double eyelid surgery, even doctors with impeccable skills and experience might face various postoperative complications. We consider that almost all complications could be divided into two groups: disordered and esthetic complications. The former primarily includes hematoa, infection, dry eye, and other complications that cause local or general dysfunction. The latter does not cause dysfunction, but the postoperative form...
does not conform to conventional esthetic standards, such as high or low double eyelid fold.

**Disordered complications**

**Hematoma**

Hematoma is one of the most common and easily manageable complications of double eyelid surgery. Hemorrhage mostly occurs from the vessels in the orbicularis oculi muscle or preaponeurotic fat. Hematomas are often caused by inadequate hemostasis, improper application of epinephrine, or poor coagulation. One study showed that administration of local anesthetics with blunt needles was less likely to cause hemorrhage and pain than that with sharp needles. In general, application of cold compress within three days of surgery can effectively prevent or control hematoma formation by promoting capillary constriction. Hematomas are usually absorbed within a short time postoperatively, but this time varies from person to person.

**Infection**

Relevant studies have shown that infection after double eyelid surgery was relatively rare, and that the use of postoperative antibiotic ointment was an effective prophylactic method. The extensive blood supply in the periorbital region is one of the reasons why postoperative infection is not common. Skin bacteria are the primary pathogens that cause most cases of infections after double eyelid surgery, but studies have also reported infections caused by *Streptococcus* and *Mycobacterium*. Orbital cellulitis is one of the most serious postoperative infections identified by symptoms such as severe pain in the orbital area, swelling, loss of vision, and ocular muscle movement disorders. Cephalosporin or broad-spectrum antibiotics, administered through intravenous drips, can be used for treatment. If severe pain or swelling is uncontrollable and continues to aggravate, a surgical incision should be performed as soon as possible. Orbital cellulitis can be divided into five types: preseptal cellulitis, postseptal cellulitis, subperiosteal abscess, orbital abscess, and cavernous sinus thrombosis. However, some scholars believe that the last three types are merely complications of preseptal or postseptal cellulitis.

**Dry eyes**

Dry eyes always occur after double eyelid surgery, especially in middle-aged and older patients. Studies have shown an incidence rate of between 8% and 21%. Patients with dry eyes usually complain of feelings such as tingling, burning, foreign body sensations, or photophobia. Conjunctivitis might also occur. Intraoperative local anesthesia, injury to the orbicularis oculi muscle, or excessive incision of the upper eyelid skin might all lead to lagophthalmos and, consequentially, dry eye after surgery. Therefore, surgeons must avoid removing too much of the orbicularis oculi muscle or skin during surgery. The relevant literature suggests that at least 20 mm of the upper eyelid skin should be retained. Patients with dry eye symptoms can use artificial tears or other lubricants. Wearing moist chamber spectacles during sleep can effectively prevent or ease dry eyes. Studies have shown that dry eyes caused by double eyelid surgery usually disappear within three months. Nevertheless, a preoperative evaluation should be performed to avoid exacerbation of postoperative symptoms in patients with a medical history of dry eyes. We usually perform Schirmer’s test to check for tear secretion function. One end of the 5-mm-wide and 35-mm-long filter paper strip is placed on the lateral one-third of the lower eyelid, with the other end left hanging outside the lower eyelid, while the eyes are kept open. The moisture distance is then measured after ten minutes. A measurement of about 10–15 mm represents a normal function, while that shorter than 10 mm or even shorter than 5 mm indicates tear secretion dysfunction. The situation in patients with dry eyes might worsen after double eyelid surgery; therefore, preoperative caution must be exercised for such patients.

**Blepharoptosis**

Blepharoptosis (or ptosis) is diagnosed when the upper eyelid covers more than 2 mm of the cornea in forward-looking eyes. It can be classified into mild, moderate, and severe according to the degree of upper eyelid drooping. We believe that ptosis after double eyelid surgery might be caused by any of the following reasons: (a) the upper eyelid skin was too loose or the amount of skin excision was insufficient, resulting in a shorter-than-normal distance between the upper eyelid margin and the corneal light reflex; that is, the margin reflex distance 1 (MRD1) is shorter than normal. This condition is called pseudoptosis, and it is common in older people; (b) intraoperative local anesthesia or swelling might cause transient ptosis. It could recover gradually after surgery, but the ptosis might affect the doctor’s judgment during surgery; (c) ptosis could be caused by injury to the levator aponeurosis or Müller’s muscle of the upper eyelid due to the use of an improper surgical technique. Therefore, we surgeons should closely monitor the depth of anesthesia during surgery and avoid damage to the levator aponeurosis, which lies behind the orbital septum. Other studies have suggested that intraoperative removal of the orbicularis oculi muscle could decrease the MRD1; (d) we also noted that patients with normal levator palpebrae superioris muscle function and power before surgery might have mild postoperative ptosis if their double eyelid crease is too high. Some scholars believe that high fixation between the levator aponeurosis and upper eyelid skin could reduce the contractile intensity or effective contraction length of the levator palpebrae superioris muscle, resulting in mild ptosis. Therefore, blepharoptosis caused by double eyelid surgery can also be classified as an esthetic complication.

**Retrobulbar hemorrhage**

Retrobulbar hematoma is a rare but extremely dangerous complication that can occur during cranial and maxillofacial fractures and reconstruction, endoscopic sinus surgery, blepharoplasty, and retrobulbar injection. As one of the most dangerous complications of double eyelid surgery, retrobulbar hematoma might lead to blindness. The mechanism of retrobulbar hematoma in double eyelid surgery remains unclear. Medical history of hypertension, vascular diseases, or damage to the periorbital muscles and vessels during surgery might increase the risk of retrobulbar hematoma. Retrobulbar hematomas might result in a continual increase in intraocular pressure, optic nerve compression, and secondary embolism in the central retinal artery that result in ischemic retina. Without early intervention, blindness might occur. Surgical decompression should be performed as soon as possible in cases of retrobulbar hematoma. Lateral canthotomy
and decompression is a commonly used method.\textsuperscript{[72-74]} Some studies have shown that, except for the time factor, younger patients with retrobulbar hematoma have a relatively low risk of vision loss.\textsuperscript{[67]}

**Esthetic complications**

We believe that there are two esthetic criteria for successful double eyelid surgery:\textsuperscript{[1]} symmetric double eyelids, and\textsuperscript{[2]} smooth and natural curve of the double eyelid crease. Any permanent postoperative morphology that does not conform to the above-mentioned standards or conventional esthetic standards could be classified as an esthetic complication.

**Asymmetry**

Asymmetry of the double eyelid is one of the most common postoperative complications, and the main complaint of patients with asymmetry is usually an unequal bilateral double eyelid height [Fig. 1a].\textsuperscript{[75,76]} There could be two reasons for this result: (a) the patient’s eyes had different degrees of upper eyelid skin laxity, and the doctor’s preoperative design was not accurate enough, resulting in double eyelid asymmetry after surgery. However, the repair should be performed about one year after the first surgery as we have observed that the eyelid crease shape gradually improves and eventually becomes symmetrical in many patients with double eyelid asymmetry shortly after the operation. Therefore, a desperation for repair might not be helpful. (b) Differences in the bilateral levator palpebrae superioris muscle power can also cause asymmetry. If the surgeon does not apply aponeurosis advancement or other muscle power adjustment measures during surgery in such patients, even minor muscle power differences will lead to unequal crease height after double eyelid surgery. The distance between the double eyelid fold and the upper eyelid margin should be larger on the weaker levator side.\textsuperscript{[59,77]} (c) Inappropriate intraoperative manipulation by surgeons could also result in different fold heights. (d) In some patients, the activity level of the periorbital muscles on both sides is not the same. The overactive periorbital muscle might shift or interrupt the connection between the levator palpebrae superioris and the skin, resulting in asymmetric double eyelids.

**Multiple creases**

Multiple creases of the upper eyelid are also common complications even in people who do not undergo double eyelid surgery.\textsuperscript{[78]} Multiple creases occur due to excessive dissection and resection of the pretarsal tissue or the orbital septum, resulting in ectopic adhesion between the levator aponeurosis and the skin, which is often accompanied by high double eyelid fold or sunken upper eyelid [Fig. 1b]. Direct excision of the skin with ectopic adhesions is the simplest treatment approach, but it is only suitable for patients with sufficient upper eyelid skin. For patients with mild ectopic adhesions, fillers or fat grafts can be injected. However, these might make the multiple creases more visible, if not handled properly.\textsuperscript{[78,79]} The ideal and most widely used treatment for multiple creases is to release the ectopic adhesion between the levator aponeurosis and skin. The key is to preserve enough pretarsal tissue to prevent the reformation of ectopic adhesions.

![Figure 1](image1.png)

*Figure 1:* Ten months after double eyelid surgery, the patient presented with double eyelid crease asymmetry (a). The patient underwent a double eyelid surgery one-and-a-half years ago. Multiple creases with accompanying high double eyelid fold and sunken upper eyelid are seen (b). The patient underwent double eyelid surgery one year ago. Currently, she presented with high double eyelid fold and the appearance of pretarsal skin looks like “flesh strip” (c)

![Figure 2](image2.png)

*Fig. 2:* Images depicting the dynamic process of the changes in appearance of the patient’s double eyelid after surgery. This patient had a hyperactive frontalis muscle. Before her double eyelid surgery (a), five months after the surgery (b), and one year after the surgery, the double eyelid crease was significantly shallower and moved downward. Moreover, a part of the double eyelid crease has disappeared (c)
If the tissue volume is insufficient, the orbital septum and the preaponeurotic fat in the septum can be pulled down to block the formation of ectopic adhesions.\cite{16}

**High double eyelid fold**

Patients with high double eyelid folds often also have sunken upper eyelids, multiple creases, etc., [Fig. 1c].\cite{16} This often happens when patients arbitrarily strive to have European eye shapes while ignoring ethnic anatomical differences. Experienced surgeons would not take this path. Many Asians are characterized by a shorter distance between the eyebrow and the eye, and thicker orbicularis oculi muscle, retro-orbicularis oculi fat, and orbital septum.\cite{14,23} Therefore, when the double eyelid crease is too high, the thick and even swollen subcutaneous soft tissue will make the crease move down and compress the pretarsal skin, giving the appearance of a “flesh strip.” In addition to the “flesh strip,” a high double eyelid crease might also cause mild ptosis after surgery because of the reasons described above. When the patient’s upper eyelid skin is relatively loose, a part of it can be resected to move the high-positioned fold downward. The height of the double eyelid crease is thus adjusted. If the upper eyelid skin is insufficient, tissue transfer is the key to repair. Re-adhesion can be prevented through tissue transfer after releasing the high-positioned adhesions. Finally, the double eyelid fold can be re-formed at a lower position. The tissues used for transfer in previous studies included prostheses, preaponeurotic fat, pretarsal fibromuscular flap, and other fat grafts. Among these, preaponeurotic fat and free fat grafts seem to perform better.\cite{82,89}

**Disappearance of the double eyelid crease**

The disappearance of the double eyelid fold is also a common complication in clinical practice. It is usually a dynamic process of the fold getting shallow, moving downward, and finally disappearing [Fig. 2]. We believe that the disappearance of the double eyelid fold is caused by the following reasons: (a) improper operation, that is, the connection between the levator aponeurosis and skin was unstable and inefficient; (b) patient factor—we believe that frequent facial expressions or hyperactivity of the orbital muscles might adversely affect the prognosis of double eyelid surgery. It is important to preoperatively identify and eliminate the factors that might negatively affect the prognosis in these patients. For example, when the frontalis muscle is hyperactive, we usually inject botulinum toxin into the forehead two weeks before surgery to inhibit the frontalis muscle activity. Compared to Caucasians, Asians have more preaponeurotic fat.\cite{21} Excessive preaponeurotic fat can compress the connection between the levator aponeurosis and skin. When patients open their eyes, the levator contracts backward. If the patient’s frontalis muscles are overactive, the upper eyelid will be forced upward. The levator and frontalis muscles contract in different directions, and the pressure of the preaponeurotic fat on the artificial connection can cause the connection to shift or interrupt easily. Therefore, botulinum toxin injections are needed preoperatively to inhibit frontalis muscle activity. Although there is no research to prove this theory, our previous work provides strong evidence for this approach. Recently, we conducted a prospective study to assess the effect of facial muscles on the prognosis of double eyelid surgery, and we believe that the experiment’s results can prove our theory.

**Discussion**

When people communicate face to face, each other’s peri orbital area is at the focus of attention. This dynamic region is an important part of feeling and emotional expression and for the perception of aging. Therefore, the periocular region is one of the most important human facial esthetic areas, which explains why blepharoplasty is the third most popular plastic procedure in the United States. Unlike the Europeans and Americans, many East Asians have features such as short palpebral fissure and single eyelid. Therefore, double eyelid surgery is more popular in East Asia. Double eyelid surgery is deceptively simple, but occasional complications are inevitable in any surgery, and double eyelid surgery is no exception. As stated earlier, we have classified the complications of double eyelid surgery into disordered and esthetic complications. Some functional complications, such as hematoma, are easy to handle, although difficult to avoid. Other complications, such as retrobulbar hematoma, require urgent management. Most of these dysfunctional complications can be avoided if doctors pay attention to the surgical details and act cautiously. The ultimate goal of double eyelid surgery, as a cosmetic surgery, is to enhance the appearance in line with general esthetic standards. How to minimize the occurrence of esthetic complications remains a core issue. The key point of double eyelid surgery is to form an effective and stable connection between the levator palpebrae superioris muscle and the upper eyelid skin—the only way by which a fold can form when patients open their eyes. In other words, any factor that affects the stability and effectiveness of this connection can cause esthetic complications. These complications might occur due to wrong preoperative design or improper operation by the surgeons; but in clinical settings, we have noted that complications occur more often because of reasons associated with the patient. For example, complications such as a high or low eyelid, or double eyelid disappearance are associated with the patient’s overactive periorbital muscles. Many East Asians have swollen upper eyelids, a short distance between the eyebrow and the eye, and a low orbital septum. When the levator palpebrae superioris muscle contracts, the preaponeurotic fat or other upper eyelid tissues might compress the connection between the levator aponeurosis and the skin. The connections might shift or be interrupted if the periorbital muscles frequently contract at the same time. This might cause the double eyelids to appear too high, too low, or disappear altogether. Therefore, we recommend the injection of botulinum toxin to inhibit muscle hyperactivity before surgery in these patients. The more common muscles involved are the frontalis muscle, corrugator supercilii, and orbicularis oculi. This injection could help avoid the occurrence of related complications and achieve an esthetic appearance after surgery.

**Conclusion**

In conclusion, adequate preoperative evaluation, careful intraoperative actions, and early identification and management of negative factors will minimize the incidence of various complications.

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**Conflicts of interest**

There are no conflicts of interest.
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