Advances of Plastic & Reconstructive Surgery

Chapter 2

Cosmetic Double Eyelid Surgery

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Aesthetic position and shape of the upper eyelid

The upper eyelid is wide, resembling a curtain-like tissue which is located above the anterior palpebral fissure of the eye. Its upper boundary is the lower edge of the eyebrow, which roughly coincides with the superior orbital margin; the lower part forms the upper eyelid margin, the inner side continues with the root of the nose and meets the lower eyelid to form the inner canthus, and the outer side continues with the zygomatic region and meets the lower eyelid to form the outer canthus. The thickness of the eyelids is 2-3mm, and the length is 26-30mm.

It makes corresponding shape changes with the opening and closing of the eyelids. When the eyes are closed and still, the vertical length from the midpoint of the lower edge of the eyebrow to the eyelid margin is between 15 and 20 millimeters. Its overall shape resembles a flat boat, with the surface skin protruding forward to form an arch, while the inner conjunctival layer is concave, and the shape coincides precisely with the curvature of the anterior part of the eyeball. There are eyelashes that bend upward and forward on the upper eyelid margin. The upper eyelid can move up and down due to the levator palpebrae superior and the orbicularis oculi, which is mainly responsible for opening and closing the palpebral fissure. The range of movement of the upper eyelid is 10-15mm. Generally, when a person looks straight ahead, the upper eyelid margin is located about 2 millimeters below the top edge of the cornea; if one open the eyes hard, the upper eyelid margin moves upward to a position about 1 millimeter above the top edge of the cornea. The opening movement of the upper eyelid reduces the vertical height of the upper eyelid, and the upper eyelid takes on a crescent shape, which is

the marked shape of the upper eyelid of Asians.

Two obvious horizontal arc-shaped shallow grooves can often be observed on the surface of the upper eyelid, which are consistent with the direction of the skin lines. The upper one is located below the superior orbital margin, called the frontal palpebral groove, also known as the upper palpebral orbital palpebral groove. This groove becomes less pronounced and shallower when the eyes are closed, but deepens and becomes more distinct upon opening the eyes, particularly in Western populations. The lower one is located corresponding to the upper edge of the tarsal plate, called the upper palpebral groove or upper palpebral double-fold groove, which is usually 5 to 6 millimeters away from the eyelid edge. An upper eyelid with this fold exhibits a layered double-eyelid appearance, whereas its absence results in a single-layered eyelid appearance, commonly referred to as a 'single eyelid'. The upper eyelid fold that forms double eyelids is the position where the folds of the upper eyelid are transformed, which is related to the termination of the tendon fibers of the levator palpebrae superior under the skin in that area [1].

Aesthetic differences between single eyelids and double eyelids

In individuals, single eyelids and double eyelids generally remain unchanged throughout life, but a few also change with age. Some individuals are born with a single eyelid structure, but as they grow older, their eyelids gradually change to a double layer; on the other hand, as they age, their upper eyelids gradually become loose and drooping, pulling down and covering the original double-folded eyelid folds on the eyelid margin, revealing a single eyelid appearance.

The upper eyelid shapes of both eyes in the population are usually symmetrical, that is, both eyes are either single eyelids or double eyelids. However, there are about 2.85% to 8.89% of individuals in the population whose upper eyelid structures of both eyes are asymmetrical, specifically manifested as one side being a single eyelid and the other side being a double eyelid, resulting in asymmetrical shapes of the eyelids on each side.

Single eyelids are rare in Westerners but more common in Easterners. In China, single eyelids and double eyelids are two different structures of the upper eyelids, and both forms of eyelids are normal. However, from an aesthetic point of view, generally speaking, most people think that eyes with double eyelids look more spirited and more charm, and the facial features also appear more elegant and dignified, and it helps to better convey emotions. Single eyelids usually give the impression of smaller eyes, a lack of spirit, and may also hinder the expression of emotions in terms of function. Therefore, forming double eyelids through cosmetic blepharoplasty not only adds to the beauty of the appearance, but also has a certain functional significance in a sense. This is also the main reason why some scholars advocate carrying out this surgery and why some people, especially young people, look forward to becoming double

eyelids through surgery [2].

Principle of forming double eyelids in cosmetic blepharoplasty

Currently, the concept of levator palpebrae superioris that conforms to the natural appearance of double eyelids is mostly used in the common double eyelid forming surgery in the medical beauty industry. The goal of all double eyelid plastic surgery is to bring the upper eyelid tarsal muscle membrane tissue or the eyelid plate closer and to create bonding and positioning with the skin near the double eyelid line of the upper eyelid. In this way, at the moment of opening the eyes (when the levator palpebrae superioris works), the eyelid plate and the upper eyelid below the bonding line are pulled upward, while the skin above the line appears loose and folds to form the layers of the eyelid, thus creating the appearance of double eyelids.

Therefore, according to the above theory, clinical double eyelid surgery can be successfully performed, but in the actual operation process, only by selecting the appropriate surgical method according to the specific condition of each recipient's upper eyelid can the best effect be achieved [3].

Indications of cosmetic blepharoplasty

In China, the upper eyelids are divided into two types: single and double, both of which are normal. From an aesthetic point of view, it is widely recognized that double eyelids can make the eyes appear brighter and more expressive, and give the face a more charming beauty and appeal; on the contrary, single eyelids often give the impression of smaller eyes and a lack of spirituality, and in terms of expressing emotions, they are not as expressive as double eyelids. Therefore, forming double eyelids through surgery not only has the effect of adding beauty to the appearance, but also has a certain effect of improving the function in a sense.

However, this does not mean that all single-eyed people must undergo double eyelid surgery, nor does it imply that every person with single eyelids will increase their appearance after becoming double eyelids. In reality, some individuals have aesthetically pleasing single eyelids that harmonize well with their facial features, especially in Eastern women, they have more charming charm.

In addition, a person's appearance is not only determined by whether the eyes are single or double eyelids. The beauty of appearance needs to consider the coordination of the five senses and the overall harmony of the face, such as the combination of face shape, eyebrows, eyes, lips, and ears, and is deeply influenced by factors such as personal temperament, character, and expression. Solely relying on double eyelid surgery or harboring unrealistic expectations for achieving facial perfection is impractical and lacks objectivity. Therefore, both the surgeon and the patient should consider comprehensively and weigh the pros and cons before

deciding whether to undergo cosmetic blepharoplasty, and must not act rashly [4].

Issues to be noted in double eyelid design

The decisive factor in determining the width and shape of the double eyelids after surgery lies in the design of the width, size, and curve of the double eyelid line before surgery. The core is to accurately mark the position of the double eyelid line, especially the central line, the inner corner line, and the outer corner line. It is generally believed that the marking point on the central line has a dominant influence on the width of the double eyelids formed after surgery, while the marking points on the inner and outer lines play a supporting role in maintaining the width, but play a major role in shaping the curvature, length, and appearance of the double eyelids. Therefore, the fixed point of the double eyelid line in the preoperative design should be a particularly important and concerned issue for the surgeon [5].

The highest point of the double eyelid line is actually not on the central line, but a few millimeters inward. It is most ideal to design it at the golden section point of the entire double eyelid line.

When marking, if the height of the inner line is < the height of the central line < the height of the outer line, the double eyelids formed after the surgery will be “open fan-shaped” or “low inside and high outside”. It will gradually widen from the inside to the outside. If it is lightly lifted and upward at the outer canthus, it will look more beautiful and generous. If you want to form a “parallel type” or “all-double” double eyelid, the heights at the inner, middle, and outer line points should be equal. If you want to form a “crescent-shaped” double eyelid, the central line should be the highest, and the heights at the inner and outer line points should be the same.

Generally, it is suitable for the height difference between the fixed point on the central line and the fixed point on the inner line to be 1 to 3 millimeters, and the height on the central line should be the same as or 1 to 2 millimeters different from the height on the outer line. The height on the inner line should be the smallest, and it must not be higher than the height on the central line and the outer line, otherwise, the shape of the double eyelids formed after the surgery will be “high inside and low outside”, and it will look like “eight-character eyes” when viewed from the overall eyes, which is not beautiful.

When planning the thickness of the double eyelid line and marking the position, it is necessary to guide the patient to lower their gaze, close the upper eyelids gently, and then draw the line. It is necessary to avoid marking the upper eyelid skin too tightly or in a loose state to avoid deviations. This operation can ensure the accuracy and effect of the double eyelid line. After the width is determined, small test needle can be used to dip in methylene blue or mauve to make marks at the fixed points by puncturing the subcutaneous. After the inner, middle, and

outer points are determined, the three points can be connected with methylene blue or mauve, and extended to a certain length inward and outward canthus according to a certain radian. After drawing the line, it can be fixed with iodine tincture.

The marking and drawing in the operation must be done before the injection of anesthetic, otherwise, it will not be accurate. During the operation, an equal amount of anesthetic should be injected subcutaneously on both sides of the upper eyelid. Generally, it is not necessary to inject too much to prevent errors caused by the injection of anesthetic or cause asymmetry on both sides. In addition, the position of the anesthetic injection should not be too deep, otherwise, it may cause paralysis of the levator palpebrae superioris and affect the observation during the operation [6].

Main methods for cosmetic double eyelid surgery

Double eyelid surgery with suturing Technique

Eligible objects: For patients with single eyelid, if the eyelid tension is healthy, the upper eyelid is light, the orbital fat layer is thin, and the upper eyelid skin is taut without laxity or prominent epicanthal folds, it is especially suitable for this surgery. Young persons with unilateral single eyelid are ideal candidates [7].

Surgical method

1) With the patient lying flat on the operating table, the surgical area of his/her eyes was subjected to standard disinfection procedures and covered with a disinfection cloth.

2) Surgical marking: By making the eyes of the patient focus on the lower end of the nasal bridge, according to the preoperative plan, with the help of methylene blue or methylene violet to mark the double eyelid line formed at the upper eyelid, and define the six points a, b, c, d, e, f in the inner, middle and outer sides, and then fix with iodine. These points a to b, c to d, and e to f should be spaced approximately 3 mm apart.

3) Anesthesia: the conjunctival surface was anesthetized with 1% tetracaine. Local anesthesia was performed with 2% procaine (five drops of epinephrine at a concentration of 1:1000 was added to per 10-ml volume) just below the skin in the area of the double eyelid line of the upper eyelid and under the conjunctiva, close to the border of the tarsus.

4) Turn over the upper eyelid so that the top edge of the tarsus and the arch area are exposed.

5) Using two large triangular needles threaded with No. 1 silk, insertions are made into the conjunctiva slightly above point a on the eyelid margin, through the levator aponeurosis of the upper eyelid and the orbicularis oculi muscle, and finally out of the skin surface of point a. The second needle entered the eyelid and conjunctiva surface 3 mm close to the first puncture

point, passed through the whole layer of the eyelid, and emerged on the skin surface of point b to complete the first set of “U” shaped mattress sutures. The second needle was pulled several times to cause slight damage and promote the stability of postoperative adhesion. In the same way, the other two groups of U-shaped mattress sutures were performed in sequence. Each group of sutures was knotted on a small silicone tube, which could help the formation of adhesion and avoid the excessive insertion of the suture into the tissue. Thus, three sets of “U” shaped mattress sutures were completed.

6) Take a thin gauze strip dipped in alcohol, wring it to be semi-dry, cover the joint at the edge of the upper eyelid, and secure with tape [8].

Postoperative care

The first change of bandage should be performed within 24 to 48 hours after the completion of the operation. If there is no infection in the wound, the gauze covering can be removed and anti-inflammatory eye drops can be used to keep the eye clean for an average of 4 to 6 times a day. The patient should take care that the suture site is kept clean and dry. Patients can be treated with oral antibiotics if necessary, and the sutures are removed on the fifth to seventh day after surgery.

Precautions during operation

(1) The surgical marking must be carried out before the injection of anesthetics to avoid errors caused by inaccurate line drawing.

(2) To prevent corneal or eyeball injury, the needle should be directed from the conjunctiva to the skin.

(3) For the objects with long palpebral fissure, 4 or 5 groups of mattress sutures can be used to enhance the effect according to the situation.

(4) The tightness of the suture should be moderate. If it is too tight, the postoperative swelling will be obvious, and even the skin necrosis under the suture will occur. Too loose will not achieve the desired effect.

Advantages and disadvantages of this surgical method

Advantages: The surgical procedure is simple and easy to perform. If the surgical effect is not as expected, we can consider turning to open surgery for further correction. This technique eliminates the process of skin incision, avoids obvious scar after surgery, and can make the pretarsal crease show a natural and elegant appearance, so it is popular in medical practice.

Disadvantages: The scope of application is relatively narrow, it is only suitable for the normal tension of the single eyelid, and it is not effective for the super tension type of the single eyelid or the single eyelid with insufficient muscle strength. The operation involves the suture of the whole layer of the upper eyelid, which may cause the obstruction of lymphatic flow. The adverse reactions after the operation are more serious, the degree of eyelid swelling is high, and the subsidence of swelling is slow. Due to the discomfort of the eye and the sensation of foreign body before the stitching is removed, many improved methods have been derived based on this surgical technique to improve these conditions [9].

Double eyelid surgery by buried suture method

Eligible objects

The buried suture method uses a fine medical suture to connect the levator aponeurosis and tarsus of the upper eyelid to the subskin tissue by needling, and the end of the suture is hidden under the epidermis, so that the eyelid forms a double-layer crease without postoperative suture removal. The application of this surgical method is basically the same as the general suture method [10].

Surgical method

(1) Patients were lying flat on the operating table, and standard disinfection of the operating area was implemented and surgical towels were placed.

(2) Surgical marking: The patient was instructed to gently close his/her eyes and look at the tip of the nose. According to the preoperative planning of double eyelid line, three pairs of points (a-b, c-d, e-f) on the medial, middle and lateral sides were established and marked appropriately. The interval between two points in each group was approximately 3 mm.

(3) Local anesthesia: First, 1% tetracaine solution was dropped into the conjunctival sac to numb the surface layer. Then the surgeon took a concentration of 0.5% procaine solution (add 5 drops of epinephrine to a 10 ml solution), opened the patient's upper eyelid, and injected approximately 0.5 ml with a No. 5 needle just above the edge of the upper tarsus and between the conjunctiva and Muller's muscle. The aim is to create a separation between the conjunctiva and the Muller's muscle and inflate it to facilitate needle entry. The purpose of using low concentration of weak anesthetics and quantitative injection is to avoid the paralysis of the levator muscle caused by excessive injection of anesthetics, which will affect the observation of the shape of the double eyelid during operation.

(4) Suturing: A 5-0 or 6-0 cosmetic nylon suture was used to enter the needle at point a, come out after hanging the fascia in front of the tarsus, then go in along point b, hang the fascia in front of the tarsus, then come out from point c, and complete the suture at points d, e and f

with the same method. Then the second needle was sutured with its paths not quite the same as the first needle. the second needle needs to trap some subcutaneous tissue, make sure that each needle is attached to the anterior tarsal fascia, and then cut off after the knot is tied under the subcutaneous tissue.

(5) 0.25% chloramphenicol eye drops or other antibiotic eye drops were dropped into the conjunctival sac after operation. The upper eyelid was covered with gauze and fixed with tape [11].

Intraoperative precautions

(1) The anesthetic should be used in a low concentration and in a quantitative manner, as little as possible, in order to prevent the anesthetic overdose from paralyzing the levator palpebrae muscle and affecting the intraoperative observation.

(2) The shape of double eyelid should be observed during operation, and the position of suture should be adjusted at any time. The ligature should be tightened appropriately to prevent the loosening of the cut tissue and loss of the function of the coil after operation.

(3) We emphasize the use of 5-0 or 6-0 cosmetic nylon suture instead of silk suture or other suture, because the latter is easy to cause foreign body reaction or formation of subcutaneous nodules and cysts.

(4) After fully mastering the operation method and technique, the operation procedure can be changed flexibly. The procedure written in this section is only for the convenience of description, and it is not necessary to adhere to this procedure in actual operation.

Postoperative care

On the second day of the operation, the patient should return to the hospital for a second visit to check the pattern of both eyelids and the healing state of the skin wound. The wound will be cleaned and disinfected, the bandage removed, and the patient will be instructed to apply antibiotic eye drops regularly for the next week. At the same time, the doctor specifically told the patient to avoid rubbing the eye hard in the near future, so as not to cause the suture to break and affect the results of the operation [12].

Advantages and disadvantages of this surgical method

The advantages of the buried suture method are: the operation is simple, the skin wound is subtle, the postoperative adverse reactions are mild, and the recovery is fast. If the effect of the operation is not as expected or the shape of the double eyelid is not satisfactory, it is convenient to fine-tune or choose to switch to other surgical methods. Considering that the upper eyelid is not easy to leave a significant scar after surgery, this technique is particularly suitable

for people who are prone to scarring.

The disadvantages of the buried suture method include: the suture can easily fall off or cut the tissue leading to surgical failure. Small suture scars or small cysts sometimes form under the skin, which are easily discernible visually or by touch when the eyes are closed. Occasionally, the knot may emerge from the epidermis, which may cause infection of the knot. Some double eyelids may fade spontaneously after this surgery.

Incisional double eyelid surgery

Surgical method [13]

(1) The patients were supine on the operating table, and routine surgical field disinfection and drapes were performed.

(2) Surgical marking: The patient was asked to close his/her eyes slightly and look at the direction of the nose tip. The double eyelid incision line was drawn on the tarsus using methylene violet or methylene blue as designed.

(3) Local anesthesia: 1% tetracaine solution was used for conjunctival sac surface anesthesia, and 2% lidocaine mixed with 1:100000 epinephrine was injected between the skin and muscle, so that the anesthetic drugs penetrated into the inner canthus. The volume of injection is usually about 1 ml per eye to avoid excessive use.

(4) Incision: A 2-mm small incision was made at the lateral canthus using an 11-gauge sharp knife blade. Use straight or curved scissors to extend into the incision and cut the entire length of the incision while separating, or directly cut the skin with a knife.

(5) Dissection: The lower edge of the incision was lifted with forceps, bluntly separated between the muscle layer and sub muscle layer, extended to the inner and outer canthus along both sides, and kept a moderate distance between the lower end to avoid touching the eyelid edge, so as to avoid damage to the root of the eyelash and the vascular arch of the eyelid edge.

(6) Through the opening of the skin, a segment of orbicularis muscle located in front of the tarsus was removed, and the subcutaneous structures on both sides of the canthus were cleaned at the same time.

(7) The excess fat tissue in the upper eyelid orbital septum was removed as needed.

(8) Instruct the patient to open the eyes, showing the initial outline of both eyelids at this point, carefully examining their appearance and curves.

(9) Suturing: Firstly, at the peak of the double eyelid curve, 5-0 or 6-0 nylon cosmetic suture

was used to pierce the skin under the incision, through the fascia at the front of the tarsus and the levator fascia, and then ran through the skin of the upper lip. When tying the knot, check the height of the eyelids and whether the lifting effect of the eyelashes is in line with expectations. Using the same technique, two stitches were made on the medial and lateral sides, and the shape and length of the eyelids were observed. Once the shape of the eyelids was satisfactory, additional stitches were added in the middle of the three stitches to fix the eyelids.

(10) Bandaging: After the operation, antibiotic eye drops were dropped into the conjunctival sac, cotton gauze was applied to the surface of the incision, and tape was used to fix it.

Postoperative management

Patients are required to follow postoperative oral antibiotics, and a dressing change is performed 24 to 48 hours after the completion of surgery. When the protective gauze is removed for the first time and no signs of infection are observed, the incision can be disinfected and cleaned, and then the surgical area can be directly exposed without covering, and an appropriate amount of eye ointment can be applied to the eye. The patient was asked to use anti-inflammatory eye drops every day to keep the wound clean and free from contamination, and come to the clinic every other day to change the dressing and observe the postoperative reaction. The suture was removed after 5 to 7 days. If there was infection, symptomatic treatment should be performed in time [14].

Intraoperative precautions

(1) Markings should be done before injection of anesthetics, and skin tension should be moderate to avoid mistakes in drawing surgical lines.

(2) The anesthetic should not be injected too much or too deep, so as to avoid the paralysis of the levator palpebrae superioris muscle and affect the observation during the operation.

(3) When separating the skin below the incision of the upper eyelid, it must be avoided to separate it too thin, which may cause the skin sheet to be too close to the tarsus, which may tighten and stiffen after the operation, affecting the appearance. Some subcutaneous tissue and the subcutaneous orbicularis muscle at the eyelid margin should be properly preserved.

(4) When trimming the orbicularis oculi muscle, the loose connective tissue in front of the tarsus should not be removed too much, so as not to damage the aponeurotic fibers of the levator palpebrae superioris. As long as the anterior tissue of the tarsus and the aponeurosis of the levator palpebrae superioris are sutured, it is not necessary to hang the tarsus too deep or the full layer of the tarsus.

(5) The muscles and connective tissue should be cleaned neatly in the inner and outer canthus,

especially when dealing with the inner canthus. When performing eyelid skin incision, 5 to 8 mm skin at the inner canthus should be left uncut to avoid directly reaching the end of the inner canthus, in order to prevent linear scars and wrinkles at the inner canthus after surgery, which may damage the aesthetic effect of the operation.

(6) The stitching must be carefully removed, there should be no residual thread, otherwise it is easy to cause suture reaction or infection [15].

Advantages and disadvantages of this surgical method

Advantages: The open surgical field makes the anatomical level of the operative area clear. When necessary, the loose skin of the eyelids and surrounding fat accumulation are removed in a clear field of vision, ensuring complete hemostasis, and the surgical procedure is precise, creating a pair of long lasting and firm eyelids.

Disadvantages: The physical injury caused by the operation is relatively serious, the operation process is cumbersome, the postoperative symptoms are more severe, and it takes a long time to recover. The postoperative incision will leave linear scars, and obvious scar hyperplasia may occur if the patient has scar diathesis.

Carbon dioxide laser double eyelid surgery

Mechanism: The photothermal effect caused by carbon dioxide laser can be used to carefully describe the pre-set eyelid crease position, so that the skin and tarsus can be closely combined, and then an ideal double eyelid appearance can be created.

Indications: It is limited to single eyelid individuals with wide palpebral fissure, thin eyelids and no skin laxity.

Surgical method: The laser beam was used to align the double eyelid line, cauterize and cut the skin along the double eyelid line to the tarsus, or cauterize the skin to the tarsus, so that the skin adhered to the tarsus to form double eyelid.

Advantages and disadvantages: Advantages include short operation time, no bleeding, rapid effect, etc. The disadvantage is that the laser is expensive, and the effect is short and disappointing, once the design is wrong, it is difficult to change. At the same time, the postoperative tissue reaction is severe, which may cause complications such as eyelid skin burn [16].

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