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Review Article

Closure Techniques and Suture Materials for Upper Blepharoplasty: An Extensive Narrative Literature Review

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Abstract

Purpose

Blepharoplasty is an operation performed for the correction of functional abnormalities and for esthetic appearance. Differences in various techniques include the wound closure technique and the suture materials used. In this review, we highlight the different closure techniques and wound suturing materials used for upper blepharoplasty.

Methods

Articles related to the current subject were researched online using Google Scholar, Embase, and MEDLINE. The search procedure was performed using several keywords. Eighteen articles were included in this study.

Results

Few studies have been conducted on this subject; however, there are various suturing and non-suturing techniques available for upper blepharoplasty wound closure, and several materials are used for these suturing and non-suturing closure techniques. These techniques include suturing with different materials, such as an adhesive made of a polymer called cyanoacrylate and wound adhesive strips.

Conclusion

The selection of the wound closure technique and material should be performed depending on the surgeon's preference and experience.

Keywords: Closure; Suture; Technique; Upper Blepharoplasty; Eyelid surgery

1. Introduction

Blepharoplasty is derived from the word blepharon, which means the eyelid, and the word plastiko, which means to mold. Blepharoplasty is a surgery that involves the excision of excessive eyelid skin, orbicularis oculi muscle, and orbital fat, which are then enveloped or sculpted to rejuvenate the esthetic appearance of the patient, combined with correction of functional abnormalities [1]. Upper blepharoplasty (UB) is one of the most common surgeries performed by a variety of facial plastic, ocular plastic, and general plastic surgeons [2]. UB is performed for facial rejuvenation and functional purposes, whereas lower blepharoplasty is commonly performed for esthetic reasons [1]. Subtleties in the closure techniques of the UBs affect the patients' outcomes. The differences in technique include the cutting techniques, instruments for the cutting process, suturing technique, and the suture material used [3]. In this review, we discuss the closure techniques and suture materials used in UB.

2. Review

The authors searched for articles related to the current subject using online research process. The search process was conducted using Google Scholar scientific website, Embase, and MEDLINE to cover articles published until October 2020. Only few studies have been conducted on this subject; therefore, we included 18 articles to extract information on the current subject. Each author was responsible for discussing one or more of the main article titles. After completing the article, each author reviewed the article as a whole.

2.1 Anatomy of the upper lid and eyebrow

Assessing the patient before surgery and performing blepharoplasty warrants knowledge of the eyelids' anatomy [1,2]. The skin of the eyelid is the thinnest in the whole body and does not possess a subcutaneous layer of fat, giving the advantage of constant movement of the eyelid during blinking of the eyes. The skin depth measures < 1 mm. The upper eyelid can be divided into the tarsal and orbital portions at the level of the supratarsal fold, which is formed by the fusion of the orbital septum, levator aponeurosis, and orbicularis oculi fascia. In Caucasian individuals, the supratarsal fold is located approximately 3–5 mm above the upper border of the tarsal plate. In Asian individuals, the eyelid lies slightly lower; it is located between the margin of the eyelid and the superior border of the tarsus, causing a single eyelid configuration. The orbital septum lies deep in the orbicularis fascia; it is continuous with the periosteum of the orbit and fuses with the levator aponeurosis 10–12 mm above the superior tarsal border. Its function is to retain the orbital fat. The preaponeurotic fat is anterior to the levator aponeurosis and posterior to the orbital septum. This layer of orbital fat is divided into the white nasal (medial) fat pad and the yellow-colored central fat pad. The levator aponeurosis and muscles

are posterior to the preaponeurotic fat pads. During surgery, it is very important to distinguish between the central fat pad and the lacrimal gland, with the latter being firm, pinkish-gray in color, and glandular in appearance [1]. It is crucial to address the eyebrows before a UB. The eyebrow is composed of muscles, fat, and pilosebaceous units. The muscles of the eyebrow are amongst the most important muscles of facial expression. The eyebrow rests on a fat pad that improves its motility; this fat is usually located above the superior orbital rim. Each of the frontalis, procerus, orbital orbicularis oculi, and corrugator supraciliary muscles are located in the region of the eyebrow. The frontalis muscle is responsible for the elevation of the eyebrow and acts as a synergist to the levator palpebrae superioris; this muscle is inserted in the skin of the eyebrow and has no bony attachments [1]. The corrugator supraciliaries insert superficially into the medial half of the eyebrow, which depresses and pulls it toward the midline. The procerus muscle contracts with the orbicularis and the corrugator to depress the eyebrow. Contraction of the procerus muscle results in the horizontal creases at the root of the nose while contraction of the corrugator creates vertical glabellar lines [1].

2.2 Upper Blepharoplasty

UB is indicated for functional purposes such as epiblepharon with lash ptosis, blepharochalasis, dermatochalasis, trauma, inflammation, and is indicated for cosmetic purposes, which is mainly an esthetic requisite [1]. There are several techniques for blepharoplasty, and they are classified into non-incision methods and incision methods; a third category may involve a partial or a mini-incision. The non-incision technique is suitable for patients who do not require skin excision and have no excess fat. The partial incision method has the advantage of being minimally invasive with the removal of excess fat. The incision technique is indicated in the presence of redundant skin or dermatochalasis, ptosis, scars in the upper lid, revision of cases, asymmetric eyelids, and fat prolapse [4]. The surgical technique of UB involves a skin pinch test to determine the amount of skin to be removed, skin marking, local anesthesia injection, skin incision, skin and muscle incision, fat removal, lid crease-forming suture, and closure [1]. Blepharoplasty is performed under either general or local anesthesia based on the preference of the patient and surgeon, need for concomitant operations, and surgical plan [5]. Blepharoplasty is performed by making an incision in the natural skin fold of the upper eyelid, which helps to hide the scar. Then, the protruding fat and the excess skin are removed. The incision may be closed using a suture that could be removed after a few days or a dissolvable suture. Scaring is a complication of blepharoplasty following surgery. There is a lack of information on the materials used and methods of incision suturing [6]. Therefore, we have attempted to provide an overview of the studies reporting suturing and closure techniques.

2.3 Wound closure techniques and suturing

The healing of the eyelid skin is faster than any other part of the body; therefore, it does not require precise closure of the wound in order to avoid complications such as scarring. Wound closure is usually performed using the finest suture [6]. The materials commonly used for wound closure include nylon, polypropylene, and fast-absorbing gut sutures and ethyl cyanoacrylate (ECA) adhesive [7]. Closure techniques involve use of sutures; it has been reported that the preferred suture material is 6-0 or 7-0 monofilament nylon, or 7-0 braided nylon. The material is removed after five days or seven days in the case of laser surgery. A suture of 5-0 or 6-0 monofilament nylon can be used as an

intracutaneous suture.2 The transconjunctival approach has very limited application in UB. The skin can also be closed using interrupted or running sutures with various absorbable or permanent materials or cyanoacrylate glue [5]. Several methods for wound closure have been used in recent decades, including the application of an adhesive made of a polymer called cyanoacrylate, which is applied to the incised skin [8,9]. Cyanoacrylate-based adhesives, such as 2-octyl-ethyl cyanoacrylate, enhance wound closure by means of self-polymerization to approximate the wound edges and aid in the re-epithelialization process. An ideal adhesive keeps the tissues joined together until the occurrence of final wound healing, provides adequate tensile strength, acts as a barrier against biological fluids, and does not alter the function of the local immune system. The adhesive material should be non-toxic, biodegradable, and should dry quickly [7]. Cyanoacrylate can solidify in a few seconds when in contact with water, and it was used for wound closure in 1949, however, its use in ophthalmology was prevalent in the 70s. Despite its bactericidal properties against gram-positive bacteria [10], cyanoacrylate has reportedly been associated with cytotoxicity in subcutaneous tissues [8]. Another wound closure strategy is the application of wound adhesive strips. This consists of fine wound adhesive strips that help in the attachment of the margins of the incised skin. The advantages over sutures and staples are that no traces of the suture will appear in the healing area and it can be applied based on the preference of the patient. This strategy also has the advantages of convenient use, resulting in less scarring formation, and reduced inflammation following the procedure [11-13]. Several studies have investigated different types and methods of wound closure in UBs. One comparative study compared wound closure using subcuticular closure and wound closure strips (Omnistrips®. Hartmann AG, Berlin, Germany). The study reported that neither method showed infection associated with the closure of the incision in both groups. However, the use of Omnistrips® was effective, safe, painless, faster, and was accompanied by a lower complication rate compared to the subcuticular suturing technique [6]. Another study that included 866 patients who underwent UB and wound closure using either 5-0 subcuticular polypropylene, 5-0 running locking polypropylene, 6-0 running plain gut, or 6-0 fast absorbing gut with two simple interrupted 5-0 polypropylene. They assessed various complications including erythema, marks, infections, dehiscence, scarring, and standing cone deformity. Fast absorbing gut with two interrupted polypropylene sutures resulted in the lowest rates of complications and revisions [14]. A previous study compared the outcomes of absorbable (6-0 fast-absorbing gut) and non-absorbable sutures (6-0 nylon) in UB. They used them in a running manner closure. The study revealed that wound healing using absorbable sutures was equivalent to that obtained with traditional non-absorbable sutures. There were no differences in healing between the two methods used for UB wound closure [15]. Another study included patients treated with traditional single suture blepharoplasty and compared them to a group of patients treated with brassier sutures. In the traditional group closure, the wounds were closed by running 6-0 nylon threads. In the brassier group, before skin closure, they passed 6-0 polyglactin sutures along the orbital rim (lateral fourth), from the orbicularis muscle just close to the inferior skin margin to the acrus marginalis periosteal layer and then to the muscle. They placed them until they detected plumping in the tissue in the sub-brow area. The study showed that both sutures in the UB were associated with a postoperative increase in the tarsal platform without any other abnormal findings

[16]. A study was conducted on Asian patients who underwent UB, and wound closure was performed using a combined anchor suture. The study showed that combined anchor sutures with external surgery were reliable for Asian patients who underwent UB in young creaseless eyelids and in eyelids with laxity due to aging [17]. One study compared suture and cyanoacrylate for wound closure. The study included 20 patients who underwent bilateral UB; in seven patients, continuous non-absorbable suture (6-0) nylon monofilament was used, whereas in 13 patients, the 2-ethyl-cyanoacrylate was used for wound closure. The average time taken for wound closure for cyanoacrylate was much less than that for the conventional suture. There were no cases of infection or wound dehiscence. The authors concluded that using 2-ethyl-cyanoacrylate was faster, effective, and safe, but not less expensive than the conventional suture, as the price of the two techniques was practically similar [10]. Another study reported no significant differences between the quality of octyle-2-cyanoacrylate and traditional suture (6-0 polypropylene or fast-absorbing gut) in one month. In addition, there were no differences between the two techniques regarding the duration of healing, wound complications, inflammation, or final incision appearance. However, it was reported that the closure time taken by the suture was less than that taken by the glue (7 minutes vs. 8 minutes, respectively) [18]. One study included three groups who underwent UB and wound closure using different materials. The study was conducted to compare ECA, fast-absorbable gut, and polypropylene. At one month, ECA was superior to fast-absorbing gut and showed a better marginal outcome compared to polypropylene, whereas both polypropylene and fast-absorbable gut showed an equivalent outcome. ECA was superior even after three months [7]. In addition, a study investigating the sutureless closure of UB using octyl-2-cyanoacrylate demonstrated that using such a material and temporary stitches removed immediately after glue crust formation was an easy and safe reproduction technique, with no variations in aesthetic outcome compared with suture closure [8].

3. Conclusion

This review highlighted the techniques of wound closure for UB using different suture materials. Few studies have been conducted on this subject; hence, we focused on the current subject in this review. Suturing techniques and non-suturing techniques for UB wound closure, as well as several suture materials that can be used for wound closure in UB exist. Non-suturing techniques were introduced since the upper lid heals fast compared to other parts of the body. Conflicts in the findings and results of the studies were noted; some studies reported the superiority of cyanoacrylate use, whereas others reported equivalent efficacy to the suture technique. This may be due to lack of sufficient studies to provide evidence and the small sample sizes included in these studies. Therefore, selection of the wound closure technique and material should be performed based on the surgeon's preference and experience along with the underlying condition of the patient. Furthermore, patients should be informed of the advantages and disadvantages of each type of closure technique and material.

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