Original Article

Medial Canthoplasty Combined with Conjunctivodacryocystorhinostomy for the Treatment of Delayed Medial Telecanthal Deformity

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Abstract

Background: Rupture of the medial canthal ligament can be caused by many events. It remains a challenge to rebuild the drainage system and restore the function. The aim of this study was to evaluate the clinical efficacy of medial canthoplasty combined with conjunctivodacryocystorhinostomy (CDCR) in patients with medial telecanthal deformities and lacrimal drainage system damage.

Methods: Twenty-two patients (22 eyes) treated with medial canthoplasty and CDCR during June 2012 to June 2014 were included in this retrospective study. For all patients, a self-tapping, titanium, low-profile head microscrew was drilled into the solid bone on the posterior aspect of the anterior lacrimal crest at the attachment position of the medial canthal ligament. Medpor-coated tear drainage tubes were applied. Distance of patient's lateral displacement before and after operation was recorded and compared. The complications of CDCR were described.

Results: Before the surgery, distance of patient's canthal displacement was 4–6 mm. The canthal distance between two eyes of patients with surgery was 1 mm or less. Among patients with CDCR, four patients had proximal obstruction and two patients had distal obstruction. Five patients had tube malposition, for example, tube extrusion 1–3 months after surgery.

Conclusions: Medial canthoplasty combined with CDCR is an effective surgical method for treatment of patients with medial telecanthal deformity and lacrimal drainage system obstruction. The study indicates that medial canthoplasty combined with CDCR surgery rebuilds normal appearance of eyelid and contour of the medial canthus and successfully repairs the function of the lacrimal drainage system.

Key words: Conjunctivodacryocystorhinostomy; Medial Canthoplasty; Medial Telecanthal Deformity

Introduction

The medial canthal ligament plays an important role in maintaining shape and function of the eyelids. Many factors might cause rupture of the medial canthal ligament, such as canthal trauma, cancer resection, and some craniofacial fractures. In the process of oculoplastic surgery, accidental avulsion of the medial canthal ligament might lead to deformed appearance of the eyelid. Disruption of the medial canthal ligament might also result in medial telecanthal deformities, including shortened palpebra, obtuse-angled medial canthi with infraplacement, increased intercanthal distance, and an absent naso-orbital valley. Meanwhile, damage of lacrimal drainage system is a common concurrent injury at periorbital region. Rebuilding of the drainage system and recovery of the function remain a big challenge.[1]

To improve the treatment of upper nasolacrimal duct obstruction or absence, Jones[2] initialized to apply a surgery named conjunctivodacryocystorhinostomy (CDCR) in 1962.

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The procedure of CDCR includes rebuilding a new drainage system between the conjunctiva and the nasal cavity using a tear drainage tube and bypassing upper lacrimal system. Although CDCR with a tear drainage tube placement is a reliable method for patients with upper lacrimal system obstruction or damage, it remains some problems postoperatively.

To our knowledge, assessment of medial canthoplasty combined with CDCR is rare in clinical study. In this research, we aimed at evaluating clinical efficacy of medial canthoplasty-combined CDCR in patients with medial telecanthal deformities and lacrimal drainage system obstruction.

Methods

Patients

Twenty-two eyes of 22 patients with surgery of medial canthoplasty combined with CDCR during June 2012 to June 2014 were enrolled in this retrospective comparative study. Patients with <3-month follow-up and without regular show-up in follow-up were excluded from the study. The study was conducted in accordance with the *Declaration of Helsinki* and was approved by the Ethical Committees of the Department of Ophthalmology, Beijing Tongren Hospital, Capital Medical University.

Microscrew fixation

Operations were performed with general anesthesia. The direction and ideal position of the medial canthus were marked on the skin [Figure 1a]. To acquire symmetric effect to the contralateral side, overreduction of 1 mm was adopted. Along the medial canthus to the marked point, a reverse Y-shaped incision was used. Scar tissues around the canthus under the canthal skin were dissected to reduce the resultant tension and avoid stretch of the tissue attachment.

Subperiosteal dissection was performed to expose the anterior lacrimal crest area. Next, a self-tapping titanium microscrew was driven into the solid bone on the posterior aspect of the anterior lacrimal crest at attached position of the medial canthal ligament [Figure 1b]. The low-profile head screw was used to avoid gliding on bone surface.

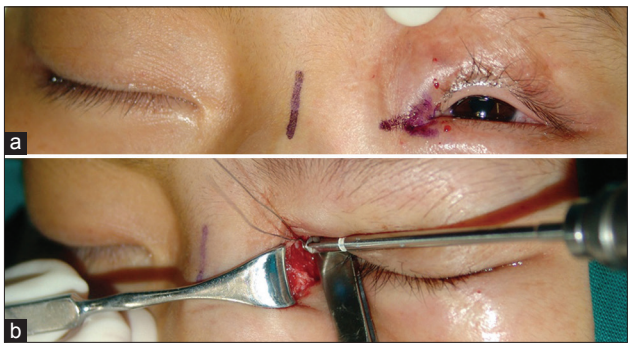

Figure 1: Microscrew fixation procedure in the canthoplasty. (a) The normal position of the medial canthus was marked on the skin. (b) A microscrew was propelled into the anterior lacrimal crest on its posterior aspect.

The 3-0 wire suture was surrounded neck of screw and passed through the stump of the medial canthal ligament by twice. The wire was tightened and twisted until firm fixation of canthus. After that, wire above on skin surface was cut and tucked into soft tissue.

Conjunctivodacryocystorhinostomy

Nasal decongestion was facilitated by packing neurosurgical cottonoids soaked in 50/50 mixture of 40% lidocaine and oxymetazoline solution into the middle meatus. Further hemostasis was achieved by direct infiltration of lidocaine with epinephrine into the site of the initial osteotomy using a 22-gauge spinal needle. Approximately, 2 ml lidocaine was injected in nasal mucosa. A 4 mm Kerrison rongeur was used to create the initial osteotomy [Figure 2a]. It should be cautious to avoid traumatizing the nasal septum or surrounding mucosa during all endonasal manipulations, as this might cause obstruction of Medpor-coated (Porex Surgical, Inc., USA) tube postoperatively. Next, bone and mucosa was removed. The desired position of the Medpor-coated tube was marked on the conjunctiva [Figure 2b]. It corresponded to a site 2.5 mm posterior to the medial commissure at the junction between the caruncle and plica semilunaris. An 18-gauge needle was then used to create a tract from the conjunctival side to the right nasal cavity. The needle was aiming toward the osteotomy created previously [Figure 2c]. The angle of entry into the nasal cavity was approximately 45°. Using simultaneous endoscopic monitoring, the 18-gauge needle could be visualized through the osteotomy site. A 23-gauge stainless steel guidewire was then placed into the lumen of the 18-gauge needle that was previously used. This stainless steel guidewire was taken from a standard silicone stent. Endoscopically, the guidewire could be seen in the lumen of the 18-gauge needle. The 18-gauge needle was positioned to avoid contact with the nasal septum. After that, outside part of the 18-gauge needle was clamped by a hemostat to measure the Medpor-coated tube. The 18-gauge needle was removed while the guidewire was left in place. The length of the clamped hemostat was measured with a caliper and the appropriately sized Medpor-coated tube was selected. The proximal and distal part of Medpor-coating part was separated from the glass tube [Figure 2d]. Further, the conjunctival tract was enlarged with a 15-gauge though the guidewire to widen the conjunctival tract before placement of Medpor-coated tube. After a few minutes, the 15-gauge needle was removed and Medpor-coated tube selected early was passed over the guidewire [Figure 2e]. The visualization with endoscopic confirmed the correct position of Medpor-coated tube [Figure 2f]. Saline irrigation into the medial canthus showed excellent drainage through the tube.

Skin suture

Different sutures were used to close the soft tissue and skin, respectively. The incision was closed using 6-0 suture, and

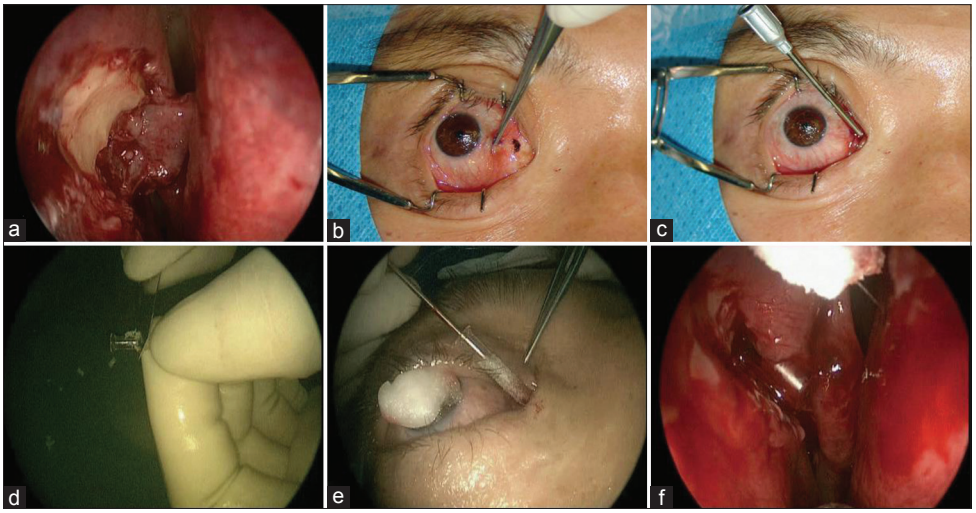

Figure 2: Procedure of the conjunctivodacryocystorhinostomy. (a) A 4 mm Kerrison rongeur was used to create the initial osteotomy. (b) The desired placement of the Medpor-coated tubes was marked on the conjunctiva. (c) The 18-gauge needle was then used to create a tract from the conjunctival side to the right nasal cavity aiming towards the osteotomy created previously. (d) The proximal and distal part of Medpor coating part was separated from the glass tube. (e) The 15-gauge needle was removed and the preselected Medpor-coated tubes was then passed over the guide wire. (f) The endoscopic view confirmed the Medpor-coated tubes was well positioned.

skin wound was smeared with erythromycin ophthalmic ointment and bandaged.

Results

In the present study, a total of 22 patients (22 eyes) were included. The mean age of the patients was 52.0 ± 14.3 years (range: 33–76 years). Fifteen patients were males (63.6%) and eight patients were females (36.4%). Thirteen patients had medial telecanthal deformities and lacrimal system obstruction in the right eye; nine patients were in the left eye. All of the postoperative data reported here were documented at the last visit of patient's follow-up.

Results of medial canthoplasty showed that, during follow-up, no common complications, such as infection, hematoma, or sensitive to temperature, were observed. The scars caused by the Y-shaped medial canthal incision were masked and tolerated well in most patients. Before surgery, distance of canthal displacement in all patients is 4 and 6 mm. The canthal distance between two eyes was corrected to 1 mm or less than in postoperative measurements of lateral displacement. Patient satisfaction survey of appearance of eyelid and contour of the medial canthus revealed high grade [Figure 3a–3d].

Results of CDCR indicated that, in aspect of obstruction, proximal obstruction occurred in four cases due to conjunctival proliferation and distal obstruction and adhesion to septum occurred in two cases due to mucosal proliferation after the primary surgery. These patients obtained further surgical intervention including conjunctival excision. As for tube malposition, five patients had tube malposition, and tube extrusion was observed between 1 and 3 months after primary surgery, two tube extrusion developed in patients.

Discussion

Injury of the midface usually results in medial telecanthal deformity. Moreover, the damage of the lacrimal drainage system also is a common concurrent injury at periorbital region. It is a great challenge to repair a medial canthus and restore the function of lacrimal drainage system. In this study, medial canthoplasty and CDCR were combined together to perform treatment on patients with medial telecanthal deformity and lacrimal drainage system obstruction.

CDCR combined with Jones tube placement is a classical technique to treat lacrimal drainage obstruction. Jones tube is made by heat resistant glass material which has poor flexibility and is prone to prolapse and dislocate. Chang *et al*.[3] reported a 13-year follow-up results of CDCR with Jones tube placement. The most common cause of failure was medial migration of the Jones tube apart from inappropriate tube insertion in primary surgery and severe inflammation. In another report,[4] a new tube, named Metaireau tube (M-tube), was used in CDCR. Although the M-tube is simple to reposition when dislocated postoperatively, it does not show better than the Jones tube including migration and extrusion in the early postoperative period. In this study, we adopted a Medpor-coated tear drain which had shown lower rate of extrusion postoperatively as reported by others.[5] However, the complication of tube obstruction was also observed during follow-up.[6]

Many surgery methods have been proposed in the management of medial telecanthal deformity. Some techniques are not applied currently, for instance, drilling two holes and inserting steel wire. In addition to the difficult procedures, they also cause damage to mucosal vessels and recurrent infection.[7] As for the transnasal medial canthopexy, it is more applicable to bilateral than unilateral

Figure 3: Representative photographs of the appearance of eyelid and contour of the medial canthus before and after surgery. (a) A 33-year-old woman with traumatic medial telecanthal deformity. (b) The 8-month postoperative photograph after screw fixation. (c) A 39-year-old woman with severe medial telecanthal deformity, underwent the surgery of medial canthal ligament reduction once. (d) The 12-month postoperative photograph after screw fixation.

medial canthopexy. The procedure is required not only to expose larger surgical area to pass a wire through a bony fenestration, but also to dissect and protect the contralateral orbit.[8,9]

In this study, we chose the posterior aspect of the solid anterior lacrimal crest to attach the medial canthus, which can restore the naso-orbital valley. As shown in the results, all patients satisfied with their appearance after surgery. The improved technique not only prevents complications which are common in other approaches but also provides an excellent method to repair ipsilateral medial canthal without causing complex naso-orbital fractures. The Y-shaped medial canthal incision described in this surgery is very small; however, it provides enough exposure area for operation under direct vision. Moreover, it is notable that the incision can minimize facial scarring and reduce operative time. It was reported that the coronal approach was complex and time-consuming for unilateral cases without craniomaxillofacial fractures.[10,11] To treat the upper nasolacrimal duct obstruction or absence, CDCR with a tear drainage tube placement is an appropriate surgical method. Nevertheless, it has several complications including tube malposition, extrusion, and proximal or distal obstruction, which are major problems that might influence surgical outcome. Other minor problems such as conjunctival irritation, corneal abrasion, infection, foreign body sensation in the eye, and lumen obstruction might also affect patient comfort.

During postoperative period, tube obstruction, caused by conjunctival or mucosal proliferation, is one of the most important reasons of CDCR surgery failure. In previous studies, Pyrex drainage tube implantation in CDCR surgeries was obstructed with tissue proliferation at a rate of 7–12%.[12-14] Fan *et al*.[15] used Medpor-coated tear drainage tubes in their surgeries, the rate of obstruction was higher compared to that of previous studies, and nevertheless, they did not show a reasonable explanation. An obstruction rate of 27.3% (6/22) was observed in the study. In our view, the obstruction might be caused due to Medpor coating. First, Medpor coating is easy to vascularization. Second, Medpor might irritate the mucous membranes around the tube and cause pyogenic granulomas.

Tube malposition or migration is a very severe problem in CDCR, which lead to failure of surgery. Malposition or shift of the tube outward could damage the ocular surface, whereas shifting inward may lead to pain, infection, obstruction, or mucosal damage.[16] During sniffing or coughing, the tube could move toward the medial or lateral, which need to be revised by surgery.[17,18] Because Medpor coating is prone to vascularization which contributes to the stability, malposition rarely happens when using Medpor-coated tube. In our series, tube malposition occurred in five patients. We questioned whether we had inappropriate surgical technique when we made the tube bed. In early stage, the tube bed was made by osteotomy, which might enlarge overly the tube bed. Afterward, we changed the surgical technique. The bone which the tube bed located was less grinded, and then the needle which is the same size with tube was pushed into the created tract from the conjunctival side to nasal cavity. In this case, tube had a very tight location. Debris or mucus accumulation could obstruct the lumen of the Medpor-coated tube in CDCR surgery. Although revision might not be required, it definitely affects patient comfort. The incidence of lumen obstruction is widely considered lower in Pyrex tubes than in silicon and polyethylene tubes.[19]

Tube extrusion is the most important complication after CDCR procedure, which leads to surgical failure and usually happened before a fistula formed during the first 6 months after surgery.[20-22] Multiple factors could influence the tube extrusion, for instance, the etiology of canalicular obstruction, the surgical method, or the shape and material of the tube.[23-25] In previously reports, Pyrex glass tube was used most commonly for its satisfactory and ideal drainage, but its extrusion rate was high as 18–51%,[16,17,20] so Medpor-coated tear drainage seemed much more stable. Fan *et al*.[15] reported that there was no case of tube extrusion observed in Medpor-coated tear drainage tube implanted cases. This study revealed two tube extrusion in patients with Medpor-coated tubes and the reason might be same as tube malposition mentioned above, as the inappropriate osteotomy cause oversized tube bed. The results provide evidence that the porous-coating Medpor tubes have good tissue compatibility, although efforts are still required to improve the ability of vascularization to prevent tube extrusion.

Lots of patients with medial telecanthal deformity are also suffered from lacrimal drainage system damage, especially after trauma. To achieve optimal anatomic outcomes and functional recovery at the same time, medial canthoplasty and CDCR were combined together to manage such kind of patients. If medial canthoplasty was performed first, the titanium microscrew might be pull away from the anterior lacrimal crest during the procedure of CDCR, leading to medial telecanthal deformities again. On the other side, the tear drainage tube might be shifted distally or proximal or even broken, during the procedure of propelling the microscrew or fastening the wire if CDCR was taken first. Therefore, the combination of medial canthoplasty and CDCR leads to a better appearance and function recovery in one time.

There are some limitations in this study. First, duration of the follow-up is short. It was only 3 months to observe

the effectiveness and complications. We will continue to investigate the long-term effect of the surgical technique. Second, this study was performed in a small group of patients. Large cohort of patients is needed for the evaluation of efficacy and complications of the surgical procedure in prolonged study.

In conclusion, according to the current study, the combination of medial canthoplasty and CDCR is shown to be a priority surgery method for treatment of medial telecanthal deformity and lacrimal drainage system obstruction. Further studies with prolonged follow-up and larger number of cases are needed.

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Conflicts of interest

There are no conflicts of interest.

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