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Long-Term Results of Frontal Lobe Suspension in Children with Congenital Dystrophic Ptosis

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A B S T R A C T

Long-term results achieved by our own operative technique in children with congenital dystrophic ptosis, with frontal muscle lobe shaping with or without shaping of corrugator muscle lobe attached to the tarsal plate, are presented. Data on 146 patients with congenital dystrophic ptosis operated on during the 1984–1998 period at Zagreb University Hospital Center were retrospectively analyzed. Postoperative success was defined as a situation with eyes open in which 1) upper eyelid covers the cornea at 12 o'clock position by 1–2 mm; 2) there is a good contour of the eyelid margin; 3) there is no lagophthalmos; and 4) there is symmetry with the other eye. Immediate re-operation due to undercorrection was required in 26 of 146 (18%) patients. Upon re-operation, 133 (91%) patients met the criteria for successful outcome at 6 months, 124 (85%) at one year, and 121 (83%) at 5 years. Correction of congenital dystrophic ptosis using a shaped frontal/corrugator lobe is an efficient and safe procedure ensuring long-lasting success.

Key words: *congenital dystrophic ptosis, frontal/corrugator muscle lobe*

Introduction

The method of correction of congenital ptosis with a weak or absent muscle activity of upper eyelid lifting has been employed at the Department since 1984[1]. After 14 years of its use, long-term effects and justifiability of the method were assessed. For proper choice of the type of correction it is necessary to estimate the lifting activity (levator muscle) and the grade of ptosis. The possibility to move the eyelid from looking downwards to looking upwards by less than 2 mm is generally considered as ptosis with a weak or even absent levator function. Currently, there are several types of ptosis surgery for children with a weak or absent levator function. Some authors prefer resection of the levator muscle in such ca-

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ses[2,3]. However, a weak activity of the levator muscle necessitates a very extensive resection of the muscular mass, thus increasing the risk of complications such as ectropion of the conjunctiva. In such cases, most surgeons choose the operative procedure of frontal suspension.

The procedure of frontal suspension consists of attaching the eyelid to the frontal muscle with additional material[4,5]. Bands made of different materials have been used for eyelid suspension. The suspension type of correction implies eyelid shortening by use of additional material (fresh or lyophilized fascia lata, biomaterials and silicones in the form of beams), which is fixed onto the tarsus plate and then passed under the orbicular muscle and skin to the frontal muscle, where it is fixed again to shorten and lift the ptotic eyelid[6].

Fresh or harvested fascia lata can be used as a material for this purpose. Fascia lata has been accepted as the best supporting material because it is superior to other materials for its high autologous and elastic properties. Lagophthalmos with or without exposure keratitis is clinically evident for the first few weeks of the sling operation. All materials including fascia lata are stiff and do not allow normal movement of the eyelids.

As we were not satisfied with the results obtained by standard frontal suspension procedures, we searched the literature for a better solution. So, we found out that in the past all the surrounding structures, including frontal lobe and flaps of orbicular muscle or corrugator supercilii muscle, had been used as a lifting material for ptosis correction[7,8]. In 1984, we applied the lobe method of surrounding muscles (frontal muscle and corrugator supercilii muscle) for correction of ptotic eyelids without or with extremely weakened function of the eyelid elevation muscle. The method implied forming lobes of the surrounding muscles, such as the frontal muscle and the corrugator supercilli muscle. In this way, we used 'bands' with maintained circulation supply to lift the ptotic eyelid. The corrugator supercilii muscle was detached from its origin to exclude the normal action of the muscle, since the normal action of the corrugator supercilii muscle is to pull the brow medially and downwards. On the other hand, the frontal muscle flap, which was brought down and sutured to the upper margin of the tarsus, functioned as an active muscle mass with maintained circulation supply and lifted the ptotic eyelid[1].

Patients and Methods

Data on 146 patients with 169 ptotic eyelids, operated on by the method of frontal and corrugator supercilii lobe suspension between 1984 and 1989 were retrospectively analyzed. Since 1990, ptosis has been corrected exclusively by the method of frontal lobe suspension. Study patients were children, mean age at the time of surgery 5.7 years (range 10 months to 14 years). There were 77 girls and 69 boys. All patients were submitted to complete ophthalmologic examination including ocular movements. Special care and repeated observation were exercised in small children, especially those under 3 years of age. The indications for surgery were poor levator action (less than 4 mm) and marked ptosis (more than 3 mm under normal lid position). Levator action is rather difficult to perform in very young children. The measurement was performed several times with toys and light, without pressing the brow. The children with bilateral ptosis generally threw the head back and rose the brow. In older children levator function was measured while sitting in front of the child and excluding the frontal muscle action by laying the thumb over the center of the brow.

Then the patient was looking down without moving the head and then looking up again. The action was measured with a millimeter rule. In children with marked ptosis in which the ptotic eyelid obstructed the visual axis and therefore normal development of all sensorimotor reflexes needed for binocular vision, the operation was performed as soon as possible, the youngest patient being 10 months old. With such an early intervention we managed to prevent the complications of nystagmus, strabismus and amblyopia that usually occur in mismanaged cases[7–11]. They were operated on under halothane general anesthesia with preoperative sedation. Unilateral ptosis was present in 123 and bilateral ptosis in 23 patients, four of them with blepharophimosis. All patients had severe ptosis with muscle function of less than 4 mm and without any previous operative procedure. During the 1984–1990 period, 63 patients underwent ptosis correction by the method of two-muscle suspension, 55 of them with unilateral and eight with bilateral ptosis. Between 1990 and 1998, 83 patients were operated on by the method of frontal lobe suspension, 68 of them with unilateral and 15 with bilateral ptosis. All operative procedures were performed by the first author[1].

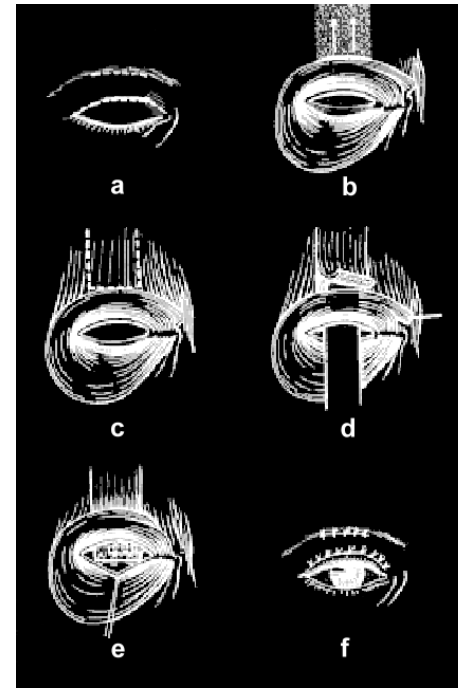

Fig. 1. Operation scheme: a – two incisions are made, one in the supratarsal crease and the second just beneath the eyebrow; b, c, d – formation of the frontal muscle flap; e – fixation of the frontalis and corr. supracilii flaps to the upper tarsal plane; f – closing the wound with sutures.

Two incisions are needed, the first of which is located at the level of the lidcrease about 8 mm from the lashes and the second in the medial third of the eyebrow through the orbicular muscle to the orbital septum, just a little more lateral from the supraorbital notch where the supraorbital nerve and vessels originate from (*b* in Figure 1). From the incision made in the lidcrease area we approach the front surface of the tarsus, which is exposed for fixation of the frontal muscle lobe. From the incision under the eyebrow a 1-cm tunnel is formed under the orbicular muscle in front of the aponeurosis to the incision made in the lidcrease (*d* in Figure 1). The upper margin of the infrabrow incision is pulled to the frontal muscle aponeurosis and a 1.5 cm wide undermining is made with blunt scissors. Another wide undermining is made in the layer between the frontal muscle and the periosteum. By two parallel incisions with sharp scissors or knife No. 11, a flap 1.5 cm wide and 1.5 cm long is formed. Passing the forceps through the tunnel from the lidcrease side under the orbicular muscle to the frontal muscle, the flap is grasped and pulled to the front surface of the tarsus and fixed to it by two Prolene 6.0 mattress sutures. The length of the lobe is approximately one half of the

forehead level because it matches the distance between the upper tarsus margin and the desired position of the eyelid margin towards the cornea limbus. Subsequently, the eyebrow corrugator muscle flap is formed by detaching it from its origin, placed over the frontal muscle lobe and fixed to the tarsus with one mattress suture (*e* in Figure 1). The skin is closed with Vicryl 6–0 resorptive suture in the area of the upper tarsus limb forming a naturally curved lidcrease, while the incision under the eyebrow is closed with fast resorptive Vicryl 6–0 (*f* in Figure 1).

Patients were hospitalized for 5 days under surgeon's surveillance, then they were seen at 1 week, 1 month, 3 months, and at yearly visits thereafter. Operative results were considered good if: 1) the upper eyelid covered the cornea at 12 o'clock position by 1–2 mm; 2) there was a good contour of the eyelid margin; 3) there was no lagophthalmos; and 4) there was symmetry to the other eye. Results were considered moderate or less favorable if complications such as undercorrection occurred.

Results

Assessment of the correction success was based on the position of the eyelid margin compared to the healthy eyelid in unilateral ptosis, and by 2 mm under the cornea limbus in bilateral ptosis, along with symmetry and absence of lagophthalmos. Immediate re-operation for undercorrection was required in 26 (18%) patients. After re-operation, 133 (91%) patients fulfilled the criteria for success at 6 months, 124 (85%) patients at one year, and 121 (83%) patients at 5 years.

From 1984 till 1989, the technique of two-muscle suspension was employed for correction in 63 patients (43%) (55 with unilateral and eight with bilateral ptosis). Immediate re-operation for undercorrection was needed in 19 (7%) patients, with good correction recorded at 6 months in 61 (97%), at one year in 60 (95%) and at 5 years in 58 (92%) patients.

Fig. 2. Child with bilateral ptosis before and 3.5 years after the surgery.

From 1990 till 1998, 83 (57 %) patients were operated on by single flap technique, seven of them requiring re-operation for undercorrection. Successful correction at 6 months, one year and 5 years was recorded in 75 (90%), 64 (77%) and 63 (76%) patients, respectively.

Fig. 3. Bilateral ptosis before the surgery, after the operation, and 4 years later.

Most common complications were stiff eyelid on postoperative day 1, which needed careful moisturizing throughout the day and patching overnight for the first week, whereafter no such treatment was required. Treatment success is illustrated in Figures 2–4.

Discussion

In children with congenital dystrophic ptosis, our own operative technique is used with a shaped frontal muscle lobe with or without shaped corrugator muscle. Long-lasting acceptable correction of the eyelid at 5 years was recorded in 83% of patients. By forming the frontal muscle lobe, which is implemented in the eyelid structure together with the associated circulation, long-term correction and elasticity of the eyelid are achieved, because the suspension material is made of active muscle structure. Two muscle flaps were used because we considered it would result in better appearance and less complications. The formation of corrugator supercilii lobe is rather difficult and time consuming. It is very important to avoid injury of the supraorbital nerve and vessels. Otherwise, sensation of the frontal region may be damaged and disruption of the vessels may lead to unnecessary bleeding. The wide blunt undermining in the layer of loose tissue between the fron-

Fig. 4. Unilateral ptosis at the time of operation and 15 years later. Below: operative result 3 months postoperatively with restored muscle function.

tal muscle and the skin on one side, and between the frontal muscle and the frontal bone periosteum on the other side permit two vertical incisions in the frontal muscle to form a flap 1.0–1.5 cm wide, its size depending on the patient age and size. According to the authors' experience, the durability and success of this technique depend on the žsurvival' of the frontal muscle lobe. They suspect that relapse occurred in situations when the muscle mass was scarred and active contraction was no longer present. The postoperative lagophthalmos was present for only few days after the surgery, thus excluding adverse side effects on the anterior segment of the eye which, in extreme cases, should be repaired even with amniotic membrane[13]. With time it turned out that forming of the corrugator lobe was not necessary, the primary function of which was to contribute to the naturally shaped eyelids along the curve of the eyeball by excluding normal action of the muscle. For this reason, the frontal muscle lobe alone has been used since 1990 with satisfactory results, however, not in such a high percent. If the tunnel for placing the frontal muscle lobe lies between the aponeurosis of the levator and orbicular muscle of the eyelid, the muscle mass does not affect the shape of the eyelid.

The corrections of ptotic eyelids with a very weak or absent muscle lifting activity by suspension are very common and are accomplished by use of different materials in the form of beams (patient tis-

sue such as fascia lata or muscle aponeurosis, or artificial materials) fixed onto the tarsus on one side and to frontal muscle on the other side. Fascia lata and muscle aponeurosis are autogenous but rather stiff, however, they are still preferred as suspension materials to foreign materials such as Silastic slings or other synthetic materials. These materials solve the defect through shortening and strengthening[4–6,14].

Older and even recent literature on ptosis contains occasional reports on good results achieved with exceptional shortening of the levator muscle. However, a weak activity of the levator muscle requires very extensive resection of the muscular mass, thus increasing the risk of complications such as ectropium of the conjunctiva. This procedure is possible, however, it merely results in shortening of the eyelid. Contrary to this, in suspension correction with the frontal muscle lobe the activity is achieved by means of regular muscle mass of other localization.

According to the authors' experience, the method of frontal lobe suspension is highly useful in children with congenital dystrophic ptosis for providing effective and long-lasting improvement free from complications such as dry eyes or exposure keratitis.

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DUGOROČNI REZULTATI OPERACIJA PTOZA REŽNJEM ČEONOG MIŠIĆA

SAŽETAK

Od 1984. g. autori primjenjuju metodu korekcije prirođene ptoze sa slabom ili odsutnom akcijom mišića dizača gornje vjeđe. Metoda se sastoji u oblikovanju režnjeva čeonog mišića i mišića nabirača obrve, koji se učvršćuju za tarzalnu ploćicu i služe kao

aktivna mišićna masa u motorici vjeđe. Metoda je objavljena u časopisu Orbit i sada nakon 20 godina primjene, autori su željeli procijeniti uspješnost provedene metode, a s time i opravdanost njezine primjene. Uspjehom smatraju položaj ruba gornje vjeđe do 2 mm ispod limbusa rožnice kod 12 sati, sa pravilnim izgledom ruba, urednim zatvaranjem vjeđnog rasporka i simetričnim izgledom obih vjeđa.