ORIGINAL ARTICLE

Surgical Treatment of Severe Degree of Ptosis of the Upper Eyelid Using a Fronto-tarsal Sling of Biocompatile PVC

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SUMMARY

Purpose: ptosis is anomalous drop of the upper eyelid. Depending on the cause of the state and especially according to the results of clinical findings (dominated significance of elevation of the upper eyelid) we can be perform various surgical procedures. Operation under Fasanella-Servat is suitable for the easiest cases - function of the upper eye-lid levator muscle (levator) is at least 10 mm and a maximum of 2 mm ptosis. Aponeurosis advancement has good results in all types of involutional origin. Eyelid levator resection is performed when the levator function is better than 5 mm. Eye-lid sling to brow lift mechanism is designed for the toughest conditions, when the levator function is worse than 4 mm. The authors present the results of surgery for ptosis with biocompatible PVC tube fronto-tarsal sling.
Methods: case-reports of 4 eyes in 3 adult patients were prospectively monitored. It was a one man and two women with different etiologies of ptosis. The principle of operation is suspension the upper eyelid to eyebrow-levators using PVC tubes in the subcutaneous tissue. Monitored parameters were: best corrected visual acuity, clinical finding of the front segment (with an emphasis on lagophthalmos in the postoperative period), eye-fissure height and levator function in millimeters (mm).
Results: there was the most severe degree of ptosis in all cases. In terms of functional and cosmetic effect treatment were surgeries successful in all patients. One half of the cases (2 of 4 eyes) had transient postoperative lagophtalmos, which in one case was solved with moisture chamber. None of exposure keratopathy developed. In one case, it was after 9 months after the operation, we had to extract one implant due to extruzion of the tube.
Conclusions: The fronto-tarsal tubing with biocompatible PVC is effective and relatively safe technique in cases of severe degree of ptosis of the upper eyelid. The material appears to be well tolerated by the surrounding tissue.

Key words: ptosis surgery, fronto-tarsal sling, biocompatible PVC

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INTRODUCTION

The reasons for abnormal drop of the upper eyelid (ptosis) are myogenic, neurogenic and other. The most frequent cause of ptosis in adult age is aponeurotic and involutional aetiology, which relates to degenerative processes of aponeurosis of the musculus levatoris palpebrae superioris (levator). Dehiscence or space-out of aponeurosis of the levator is characterised by a medium-severe drop of the upper eyelid, with well preserved function of the levator. There is generally a higher position of the fold of skin of the upper eyelid, the tissue of the eyelid creates an impression of attenuation, and there is a deep sulcus of the upper eyelid.

The normal position of the upper margin is approximately 2 mm below the upper limbus and the position of the lower margin approximately 1 mm below the lower limbus. The vertical size of the ocular rima is generally 7-10 mm in men and 8-12 mm in women. The scope of unilateral ptosis can be evaluated (measured) according to a comparison with the finding on the other side [6].
Drooping of the eyelid practically always causes objective and subjective ocular complaints. In more advanced cases it also involves an undesirable cosmetic effect of ptosis.
The degree of ptosis of the upper eyelid, and especially of the function of the levator, evident upon clinical examination, are of key significance in the diagnosis of common types of ptosis, and are decisive for planning the correct type of surgical procedure. According to the clinical finding we evaluate the degree of ptosis: mild (drop of 2 mm, function of levator above 8 mm), medium (drop of 3 mm, function of levator better than 5 mm) and severe (drop of 4 mm and function of levator 0-5 mm).
The therapeutic options are practically only surgical, and cover several types of procedures and variants thereof [1]. The clinical finding is a guide to a correctly indicated procedure and good functional and cosmetic result [4]. The basic types of surgeries are: truncation of upper part of tarsus together with Müller muscle (a surgery according to Fasanella-Servat procedure),

resuture or truncation of aponeurosis of levator, resection of levator and suspension of upper eyelid on the eyebrow lift mechanism (fronto-tarsal sling). Surgeries for aponeurosis and the levator can be performed via a trans-cutaneous and transconjunctival approach.
The surgery according to the Fasanella-Servat procedure is chosen for the easiest cases – the function of the levator is minimally 10 mm and ptosis maximum 2 mm. Resuture or truncation of aponeurosis of levator have good results on practically all ptoses of aponeurotic and involutional aetiology. Resection of the levator of the eyelid is performed if the function of the levator is better than 5 mm. Use of a fronto-tarsal sling is designated for the most severe conditions, in which the function of the levator is worse than 4 mm.
For the purposes of a fronto-tarsal sling on the eyebrow levator it is possible to use various types of materials: allogeneic fascia lata (a surgical procedure according to Crawford), or xenogeneic substitutes: silicon tube (Visitec® Seiff frontalis suspension set) [3], polypropylene (Prolene®), polyamide (Supramid Extra® II), polyester (Mersilene® mesh) or expanded polytetrafluoroethylene (Gore-tex, Ptose-up) [8].

METHODOLOGY

We evaluate our results in a series of case reports, in which severe degree of ptosis of the upper eyelid was resolved by a fronto-tarsal suspension surgery from the eyebrow levator and subcutaneously using a sling made of a biocompatible PVC tube (PVB tube, code MZDRX00IJ9H7, manufacturer: Medi-Globe, s.r.o.). We evaluated the clinical finding according to an objective measurement of the position of the eyelid and the function of the levator. We measured the position of the upper eyelid (degree of drop of margin) as the vertical distance of the edges of the upper and lower eyelid (height of eye-slit in millimetres) [7]. We measured the function of the levator as the degree of excursion of movements of the upper eyelid upon maximum downward and upward gaze. In this measurement it is necessary to hold the eyebrow firmly (in order to eliminate the effect of the musculus frontalis) [6] (Fig. 1 and 2).
The group consisted of 4 eyes of three patients. Patient 1 was a man aged 42 years who had total unilateral ptosis of post-traumatic aetiology. Patient 2 was a woman aged 86 years (very active), who suffered from a severe degree of ptosis on an involutional basis and had already undergone a bilateral procedure of the type of plication for levator aponeurosis, which had had only a transitory effect. In patient no. 3 (woman aged 41 years) this concerned a recurrence of congenital ptosis operated on in childhood.
Surgical technique: in all cases we used a fronto-tarsal sling made of PVC tubing under local anaesthesia [9]. The principle of the surgery is the insertion of a silicon tube between the tarsus and its cutaneous covering, with subsequent guiding of the ends of the tube above the eyebrow and ending in the frontal region. The procedure begins with the indication of a pair of skin incisions: 2-3 mm from the limbus on both sides of the central third of the upper eyelid and at the upper edge of the eyebrow (slightly further from one another than on the eyelid), and one incision in the frontal region above the previous two (Fig. 3).
We then perform subcutaneous infiltration anaesthesia (Marcaine and Supracaine in a ratio of 1:1) along the entire prospective course of the tube being down-pulled. The skin incisions are made by a scalpel and the silicon tube is guided through the subcutaneous tissue using a Wright needle on the fascia (Fig. 4). We begin in the depth of the pre-tarsal musculus orbicularis between the incisions above the margin. Then both ends of the silicon tube are guided above the eyebrow (Fig. 5) and further into the central incision, where they are connected with a flexible sleeve (a Watzke sleeve can also be used) (Fig. 6). The position of the upper eyelid can be further corrected using supporting sutures, pulled behind the tube in the places of the eyelid incisions. We then draw close the ends of the tubes in the sleeve in such a manner as to ensure that the margin of the upper eyelid does not extend beyond the upper limbus. Excess ends of the tube are trimmed, and their join is embedded in the depth of the subcutaneous tissue, where they are not fixed. We stitch the subcutaneous tissue above the tubes with an absorbent 6/0 suture and the skin with an absorbent embedded 6/0 suture. The stitches do not require extraction. We do not suture the incisions on the eyelid whatsoever.

RESULTS

Patient no. 1 (total post-traumatic ptosis in a 42-year old man) hit a wire in June 2012 and tore off practically his entire upper eyelid. The wound reached from the inner

Fig 1

Fig 2

Fig 3

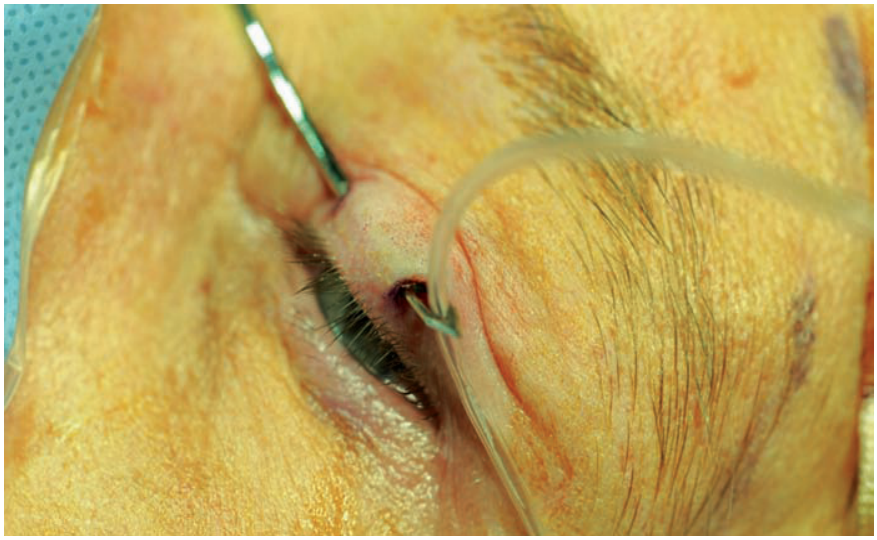

Fig 4

corner (injury to upper canaliculus of lacrimal pathways) parallel to the margin at a height of approximately the orbito palpebral sulcus, and ended above the outer corner. The primary suture was performed at another site. Upon examination at our site (after an interval of 6 months), the height of the eye-slit is 0 mm and the levator function 0 mm. The upper eyelid extends over the margin of the lower eyelid and at the same time is horizontally lax due to a malfunction of the internal ligament. Visual acuity is bilaterally 20/20. The lower lacrimal punctum is clear (Fig. 7). The extraocular and intraocular finding is normal in the other eye.

The patient underwent a surgical procedure, in which the following was performed in a single operation: horizontal truncation of the upper eyelid, connection of the tarsus to the internal ligament and fronto-tarsal suspension. In the postoperative period mild ptosis persists, which is correcting itself with the subsidence of oedema. The anterior segment was without complications (not even transitional lagophthalmos occurred). Visual acuity was very good 1 year after the procedure (Fig. 8).

Patient no. 2 (severe bilateral involutional ptosis in 86 year old woman with only short-term effect of surgery of the type plication for levator aponeurosis) also had an eventful anamnesis. At the age of 80 she underwent bilateral cataract surgery, after which ptosis transitionally appeared on the right side. 3 years later she reported with a finding of bilateral involutional ptosis, which was resolved by plication for levator aponeurosis (via trans-cutaneous approach) in both eyes. Concurrently with this type of surgery, blepharoplasty of dermochalasis was performed on both sides. The effect of the procedure was functionally and cosmetically good for approximately 2 years, after which a recurrence of bilateral ptosis occurred. The height of the ocular rima was 4 mm in the right eye, 1 mm in the left eye and the function of the levator 5 mm in the right eye and 3 mm in the left eye (Fig. 9).

Visual acuity was 20/32 bilaterally. The clinical finding of a drop of the eyelid on the right side was on the boundary of indications for

resection of the levator or a fronto-tarsal sling. With regard to the scarry, altered terrain following the previous procedures, we indicated a suspension surgery; first in the left eye, then in the other eye after an interval of 2 months. Lagophthalmos appeared in the left eye (3 mm) in the early postoperative period, which required weekly application of a moisture chamber and subsequent fortnightly application of lubricants. Exposure keratopathy did not develop. The condition spontaneously corrected itself; lagophthalmos subsided, as well as the patient's subjective complaints. Logophthalmos did not occur in the right eye, but the patient had a feeling of dryness and burning in the eye, which we resolved by means of fortnightly therapy with ocular lubricants. Visual acuity at the end of the eleven-month observation period remained 20/32 bilaterally. After an interval of 9 months from the surgery, a skin defect appeared in the right half of the forehead (in the area of the embedding of the connected parts of the tubes), with progressive extrusion of the distal ends of the implants. Excision of the septic edges of the wound was performed, followed by flushing with Betadine and embedding with fixation of the implant into the depth of the subcutaneous tissue by suture. The wound initially healed per primam intentionem, but after approximately two weeks the extrusion formed again and the implant was extracted. Subsequently the wound on the forehead healed without complication; however the upper eyelid again dropped to the preoperative level.

In patient no. 3 (woman aged 41 years), this represented a recurrence of congenital ptosis, which was operated on at the age of 10 years at another site (we do not know the preoperative finding or the type of surgery performed). The upper eyelid then dropped again approximately 3 months after the surgery. She came to us at the age of 40 years; the height of the ocular opening is 4 mm and the function of the levator 4 mm. The upper eyelid has a higher recess than on the other side, and creates an impression of mild atrophy. For these reasons, we first of all attempted to perform surgery for aponeurosis of the levator: dystro-

Fig 5

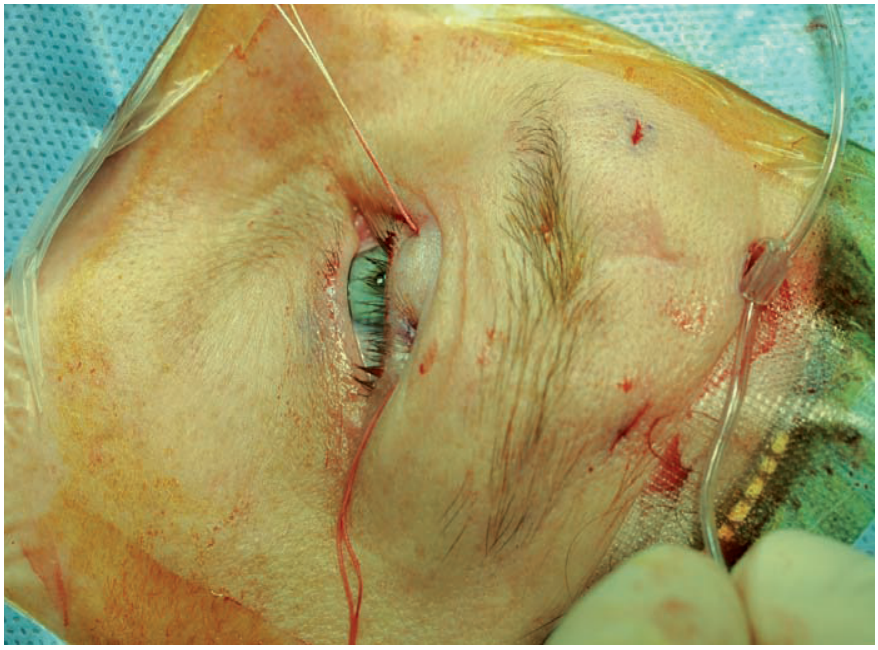

Fig 6

Fig 7

Fig 8

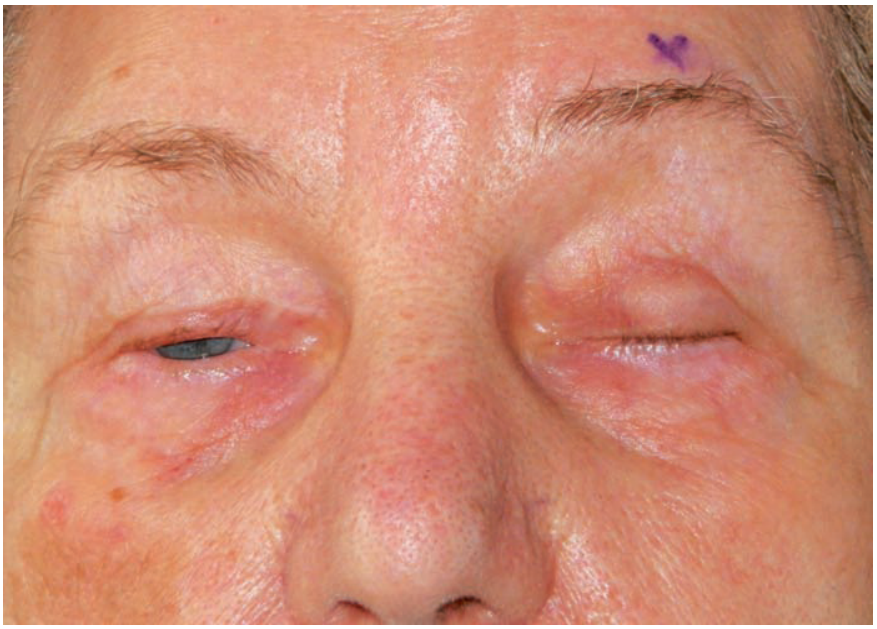

Fig 9

Fig 10

phically altered aponeurosis was found in the fibrotic terrain from the trans-cutaneous approach, and this was sutured to the upper edge of the tarsus. The perioperative functional finding was good, in the early postoperative period mild lagophthalmos occurred, which was not accompanied by subjective complaints or keratopathy. After almost six months, however, there was a recurrence of ptosis to its original level (Fig. 11).

Due to expected fibrotisation following the previous procedures, we did not attempt resection of the levator again, and performed suspension by a sling made of tubing. The resulting effect at the end of the nine-month observation period is presented in Fig. 12.

DISCUSSION

Use of a fronto-tarsal sling has both advantages and disadvantages [3]. We consider the advantages to be: technical simplicity of the procedure, possibility of practically immediate performance of function, good availability and price of used material, possibility of use also for ptoses on which previous surgeries have not been successful, possibility of use even on very small children (where autologous fascia cannot be taken). If necessary, for example in the case of exposure keratopathy, the tube can be extracted relatively simply [5], which was confirmed also in our case. This type of procedure also does not prevent the applicable performance of other types of surgeries for ptosis in future (for example resection of levator).

We consider the disadvantages to be the risk of lagophthalmos and exposure keratopathy, the incidence of infection complications, granulomas or the development of extrusion of foreign material [5]. From this perspective, the ideal type is a surgery with use of autologous fasciae latae. Granulomas and extrusions are considerably more common upon the use of Mersilene mesh material or expanded polytetrafluoroethylene (Gore-Tex). Furthermore, these materials are far more difficult to extract if necessary [5, 10]. In all cases it is suitable to embed xenogeneic implants as deep as possible.

Probably the most complex problem

in the entire procedure is achieving a good cosmetic effect in the sense of lateral symmetry. For this reason some authors recommend a bilateral sling, even if the condition is unilateral [2]. It is also possible in the case of necessity to weaken the function of the levator in the other eye, because a mild drop of the upper eyelid is cosmetically better (more natural) than retraction thereof. In planning the procedure and how radical it should be, it is necessary to take into account also the following clinical experiences: upon covering of the eye without ptosis this condition sometimes corrects itself, and upon elevation of the eyelid with ptosis the other upper eyelid sometimes drops. Attaining symmetry may then be a real challenge, and for this reason we do not recommend that patients are promised a perfect cosmetic result. It is always necessary to assess the drop of one eyelid as a bilateral problem.

CONCLUSION

A fronto-tarsal sling of made of biocompatible PVC seems to be an effective and at the same time relatively safe technique in cases of severe degree of ptosis of the upper eyelid. The used material is well tolerated by the surrounding tissue.

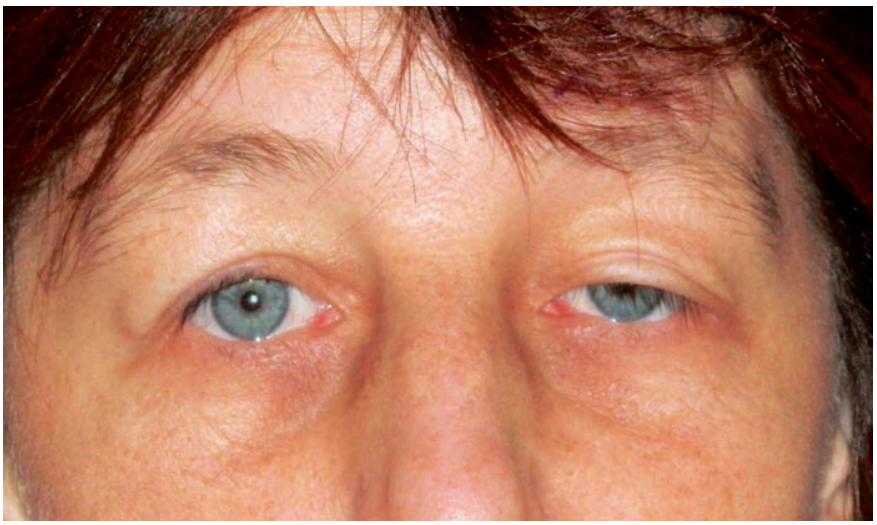

Fig 11

Fig 12

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