

IRENEUSZ ŁĄTKOWSKI^{1,2}, MAŁGORZATA KUŻLAN², PIOTR DROZDOWSKI^{2,4},
MICHAŁ KNAKIEWICZ², JAROSŁAW MAREK³, KATARZYNA KNAKIEWICZ³

Lid Loading in Facial Palsy – an Efficient Method of Treating Lagophthalmos

Obciążanie powieki górnej złotą płytką – skuteczna metoda leczenia porażonych powiek

¹ Clinic of Plastic Surgery, Wrocław Medical University, Polanica-Zdrój, Poland

² Department of Plastic Surgery, Medical Centre, Polanica-Zdrój, Poland

³ Department of Ophthalmology, Medical Centre, Polanica-Zdrój, Poland

⁴ Department of General Surgery, Regional Hospital in Kędzierzyn-Koźle, Poland

Abstract

Background. Facial nerve paralysis may have devastating ocular complications. In most advanced cases it may lead to blindness. Its treatment starts with conservative methods. In case of their failure, surgical procedures are engaged.

Objectives. The aim of the work was to evaluate surgical treatment results of lagophthalmos caused by facial nerve paralysis of a patient group treated in the years 2003–2010 in the Regional Hospital for Plastic Surgery and Wrocław Medical University Clinic of Plastic Surgery in Polanica-Zdrój.

Material and Methods. Thirty patients presenting lagophthalmos resulting from facial nerve paralysis or paresis were treated by upper lid loading with golden plates. A follow-up examination performed by a plastic surgeon and ophthalmologist was followed by a questionnaire concerning the patients' self-evaluation.

Results. After the treatment most of the patients (54.5%) presented no or slight lagophthalmos in the upright position. Symmetry of the palpebral aperture was satisfactory in 64% of the cases. The patients reported an appreciable decrease in pain (100%) and dryness sensation (64%). The complication rate was low (10%) and consisted of allergic reactions which ceased after implant substitution. Immobility of the operated eyelid was the result in only 18% of the patients. All the patients who had a golden plate implanted would be willing to undergo the same procedure in the future.

Conclusions. Upper eyelid golden plate loading is a safe and efficient method of surgical treatment of lagophthalmos. It improves the aesthetics and function of paralyzed eyelids and prevents the occurrence of serious complications (Adv Clin Exp Med 2011, 20, 5, 627–633).

Key words: facial palsy, lagophthalmos, lid loading, efficacy, safety.

Streszczenie

Wprowadzenie. Porażenie nerwu twarzewego może mieć fatalne skutki, w najcięższych przypadkach prowadząc do ślepoty. Leczenie rozpoczyna się od metod zachowawczych. Jeśli one nie są skuteczne, korzysta się z metod chirurgicznych.

Cel pracy. Przedstawienie wyników chirurgicznego leczenia niedomykalności powiek w przebiegu porażenia nerwu twarzewego w Wojewódzkim Szpitalu Chirurgii Plastycznej, a następnie Klinice Chirurgii Plastycznej Akademii Medycznej im. Piastów Śląskich we Wrocławiu z siedzibą w Polanicy-Zdroju w latach 2003–2010.

Materiał i metody. Trzydzieścioro pacjentów z niedomykalnością szpary powiekowej w przebiegu porażenia nerwu twarzewego zostało poddanych leczeniu operacyjnemu polegającemu na wszczepieniu złotej płytki w powiekę górną. Badanie kontrolne zostało wykonane przez chirurga plastyka i okulistę. Dodatkowo pacjenci wypełnili ankietę oceniającą wynik leczenia.

Wyniki. Po leczeniu u większości pacjentów (54,5%) w pozycji stojącej niedomykalność szpary powiekowej albo nie występowała zupełnie, albo była bardzo małego stopnia. Symetria szpar powiekowych została określona jako dobra w 64% przypadków. Jedynie u 18% pacjentów ruchomość powieki górnej została upośledzona. Wszyscy pacjenci odnotowali ustąpienie dolegliwości bólowych, a u 64% nastąpiło zmniejszenie uczucia suchości. Odsetek

powikłań był mały (10%), a powikłania obejmowały reakcje alergiczne na wszczepiony materiał, które ustępowały po wymianie implantu. Wszyscy pacjenci zdecydowaliby się ponownie na poddanie się omawianemu zabiegowi.

Wnioski. Obciążanie górnej powieki złotą płytką jest bezpieczną i skuteczną metodą chirurgicznego leczenia niedomykalności szpary powiekowej. Poprawia wygląd oraz czynność aparatu ochronnego oka i zapobiega wystąpieniu poważnych powikłań (*Adv Clin Exp Med* 2011, 20, 5, 627–633).

Słowa kluczowe: porażenie nerwu twarzewego, niedomykalność powiek, obciążanie powieki górnej, skuteczność, bezpieczeństwo.

Facial nerve paralysis results from various conditions which may be divided into the following groups: congenial (Moebius syndrome), acquired (Bell's palsy, vascular or neoplastic lesions), iatrogenic, infectious or related to degenerative diseases [1]. Patients presenting complete facial palsy are prone to elevated risk of developing ocular complications. Eye blinking and eyelid closure mechanisms are thus impaired (Figs. 2a,b) [1]. Other eye protective mechanism disorders such as diminished tear production, lagophthalmos, and ectropion and brow ptosis may lead to conjunctivitis and cornea ulceration, which may result – in the most advanced cases – in eye globe perforation and blindness [2]. Bacterial infection often occurs, which aggravates the condition.

Lagophthalmos treatment aimed at prevention of its consequences starts with conservative methods such as ointments, moisturizing collyriums, eyelid taping, so-called “moist chambers” or soft contact lenses. Levator palpebrae muscle weakening by botulinum toxin type A injection constitutes another non-surgical method of lagophthalmos correction [3, 4]. Surgical treatment is reserved for the patients who do not respond to conservative methods.

Partial or total tarsorrhaphy constitutes the simplest among lagophthalmos surgical correction methods. It is based on reducing the area of the cornea permanently exposed to the exterior environment. Impairment of vision and a hardly acceptable aesthetic outcome constitute the major disadvantages of the method [5].

Surgical treatment of lagophthalmos resulting from lower eyelid ptosis is based on medial ligament and canthal plasty, the Kunth-Szymanowski procedure or lower eyelid lifting using a fascia strip. Lagophthalmos resulting from upper eyelid disorders is treated in most cases by implantation of metal weights which act either as an upper lid load or their action is based on their elasticity [2, 6, 7]. Bach et al. [8] propose another method of paralyzed eyelid surgical treatment: levator palpebrae muscle lengthening.

Gold weight implantation constitutes the most common method of lagophthalmos surgical management method in complete facial palsy. The procedure was first described by Illig in 1958 [9], but it was Sheehan in 1950, who proposed upper eyelid loading using steel mesh [10]. Among the metals

used in this procedure, gold, platinum, tantalum and steel are the most commonly mentioned [11], gold being the most frequently chosen for its high molecular weight (19.3 g/cm³), malleability and rare allergic or foreign body reactions [1, 11]. In rare cases of allergic reactions or reactivity to copper contained in the golden implant, an alternative metal – platinum – is used. It is characterized by a molecular weight of 21.5 g/cm³ and biological inertness remarkably higher than gold [11].

In the Regional Hospital for Plastic Surgery and Clinic of Plastic Surgery in Polanica-Zdrój, lagophthalmos resulting from facial palsy has been treated surgically since 1975. Performed procedures, based on specific indications, included: eyelids reanimation using temporalis muscle (including the method modification by Labbe'), lower eyelid operation by Kunth-Szymanowski, upper eyelid metal weight (gold or platinum) loading, lower eyelid, cheek and mouth lifting on fascia strip, tarsorrhaphy, canthopexy and brow lift. Lid loading procedures were introduced in 2003. Apart from the above-mentioned procedures aiming at globe protection, other facial palsy symptoms involving the middle and lower third of the face are addressed as well.

The aim of the work was to evaluate the results of upper eyelid gold loading in lagophthalmos caused by facial nerve paralysis.

Material and Methods

In the years 1975–2010 in the Regional Hospital for Plastic Surgery and Clinic of Plastic Surgery in Polanica-Zdrój, seventy-four patients [38 women and 36 men) were operated on for facial paralysis (n = 69) or paresis (n = 5). In the majority of cases all branches of the facial nerve were involved (n = 69). In two patients, the ocular and frontal branches, in 2 patients, ocular and lower branches, and in 1 person only the frontal branch was involved. Facial palsy etiology is summarized in Table 1. It most commonly occurred in patients aged between 20 and 60 years. Surgical treatment was performed from 2 to 12 years from the onset of the disease.

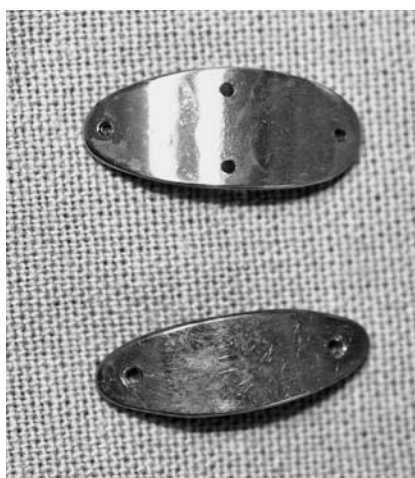
In the years 2003–2010, thirty patients presenting lagophthalmos were operated on in the Regional Hospital for Plastic Surgery and Clinic of

Table 1. Facial palsy etiology**Table 1.** Etiologia porażenia nerwu twarzewego

Etiology (Etiologia)	Number of patients (Liczba pacjentów)	Percentage (Odsetek)
Central nervous system neoplastic lesions (Zmiany nowotworowe ośrodkowego układu nerwowego)	63	85
Parotid gland neoplastic lesions (Zmiany nowotworowe ślinianki przyusznej)	4	5.4
Stroke (Udar)	1	1.4
Congenital (Wrodzone)	2	2.8
Idiopathic (Idiopatyczne)	4	5.4

Plastic Surgery in Polanica-Zdrój using the upper lid loading technique.

The inclusion criterion for the procedure was lagophthalmos resulting from orbicularis oculi muscle dysfunction. On admission, an estimative lead weigh was taped to the upper eyelid. Over next 24 hours the function of the eyelid was observed and the patient estimated its tolerance rate. The metal plate weight was adjusted until satisfactory results were obtained (eyelid closure without upper eyelid ptosis in an upright position). Based on the chosen model, a golden plate was then prepared in a goldsmith laboratory. In the years 2003–2009, gold of millesimal fineness 750, and from 2010, of millesimal fineness 916, was used. The plate was slightly curved which fitted the curvature of the cornea. The

**Fig. 1.** Golden plate with 4 (up) and 2 holes (bottom)

Ryc. 1. 4-otworowa (góra) i 2-otworowa (dół) złota płytki

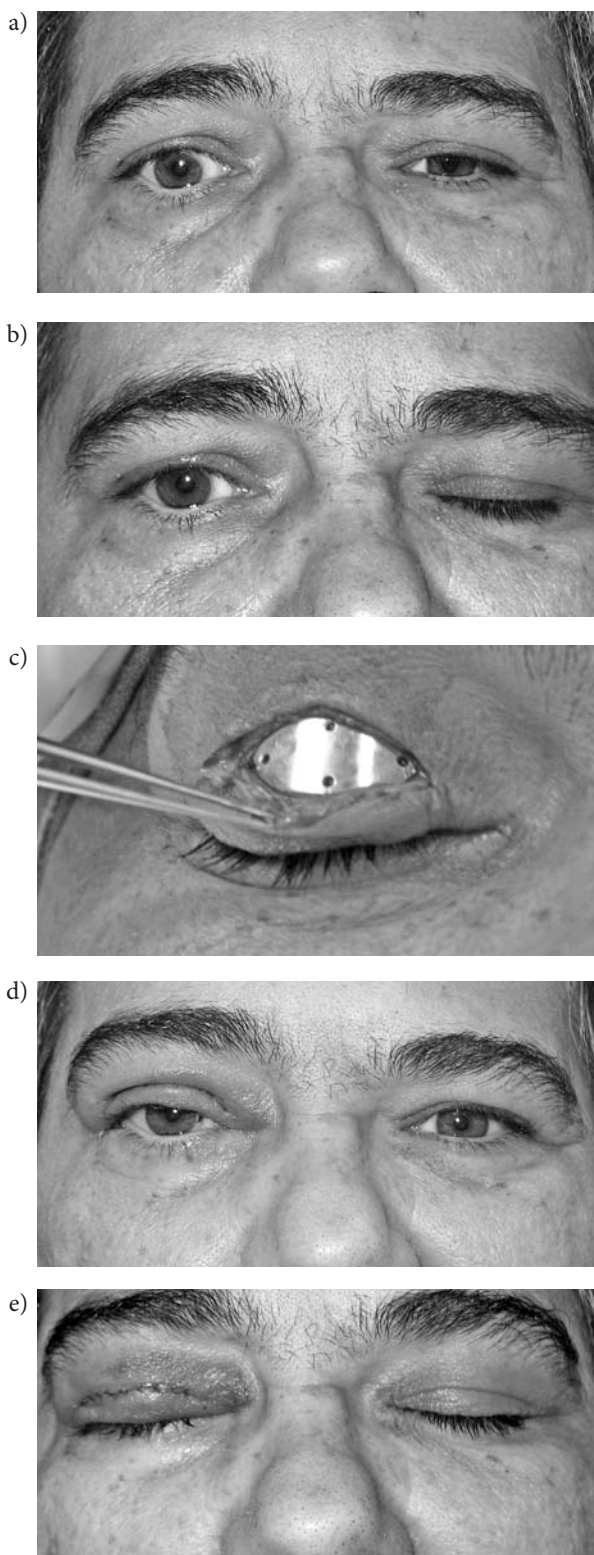


Fig. 2. Typical lagophthalmos treatment result by upper eyelid loading with golden plate: a) before treatment with open eyes, b) before treatment with closed eyes, c) intraoperative view, d) post treatment with open eyes, e) post treatment with closed eyes

Ryc. 2. Przykład typowego wyniku leczenia niedomykalności powieki górnej za pomocą implantacji złotej płytki: a) przed operacją przy otwartych oczach, b) przed operacją przy zamkniętych oczach, c) widok śródoperacyjny, d) po operacji przy otwartych oczach, e) po operacji przy zamkniętych oczach

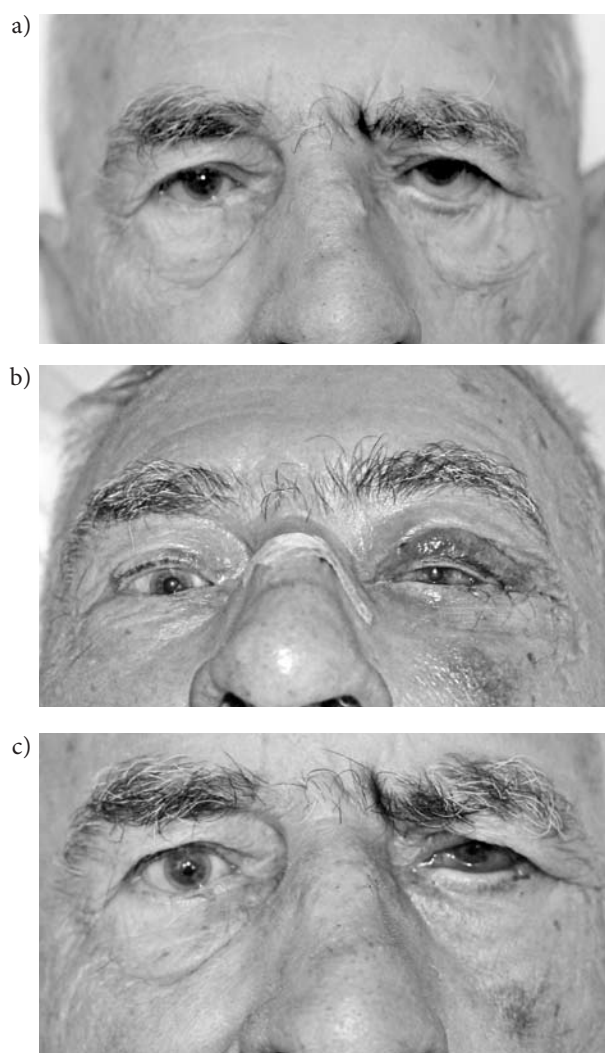


Fig. 3. Simultaneous upper eyelid loading with golden plate and lower eyelid operation with the Kunth-Szymanowski method: a) before treatment, b) post treatment – early result, c) distant result

Ryc. 3. Przykład jednoczesnego leczenia niedomykalności powieki górnej złotą płytką i powieki dolnej metodą Kuntha-Szymanowskiego: a) przed operacją, b) po operacji – wczesny wynik, c) wynik odległy

plate had from 2 to 4 holes in order to enable firm attachment of the prosthesis to the tarsus (Fig. 1).

The surgical procedure was performed under local anesthesia with 0.5% lignocaine with norepinephrine. The skin was incised in the tarsal crease. The orbicularis muscle was split and the tarsus was exposed. Next, a pocket in overlying tissues was prepared, which enabled positioning of the implant and its tension-free closure. A non-absorbable 6/0 suture was used to fix the plate (Fig. 2c). The wound was then closed in layers (Figs. 2e, 2d). In some patients, the procedure was combined with other corrective operations such as lower eyelid Kunth-Szymanowski plasty (Figs. 3a–c) or malar lifting on the fascia strip (Figs. 4a–d).

A follow-up examination was performed by a plastic surgeon and an ophthalmologist. The following parameters were evaluated: degree of lagophthalmos, eyelid mobility, aesthetic result, symmetry of the eyelids and complications. In addition, all the patients were sent a questionnaire in which they were asked about the eyelid function and appearance. Eleven patients (7 women and 4 men) aged 29–69 years (mean 53.4) responded to the questionnaire.

Results

In an upright position 54.5% of the patients did not present any degree of lagophthalmos, the same percentage presented 1 mm of lagophthalmos and in 9% it was more than 1 mm. In a prone position, only 18% of the patients did not present any degree of lagophthalmos, whereas in the remaining patients its degree was equal to 1, 3, 5 and 6 mm in 27, 45.5, 18 and 9%, respectively.

Palpebral fissure symmetry was observed in 27% of the patients. Its vertical asymmetry of 1, 2, 3 and 4 mm was observed in 9, 27, 18 and 18% of the patients, respectively. Eighty-two percent of the patients maintained the mobility of the eyelid, which they could elevate by 1–2 mm (27%) and 3 mm (55%). Only in 18% of the patients did the eyelid remain immobile. The implant was slightly visible in 54.5% of cases, not visible in 18%, and in 27.5% of the patients, the outline of the plate was highly remarkable.

As much as 91% of the patients stated that the treatment result was appreciated by their environment. In 27% they described the result as a “significant improvement of their appearance”, whereas as much as 72.7% of treated patients stated that “their appearance rather improved”. They regarded the function of eyelid closure similarly. Sixty-three point six percent of the patients described the result as a “significant improvement of function”, while 36.4% “slight improvement”. None of the patients stated that the appearance or function of the eyelids remained the same or got worse. However, 54.5% regarded the palpebral fissure as “slightly asymmetric” or “evidently asymmetric”. The implant was regarded as “slightly visible” by 45.5% of the patients and “visible” by 54.5%, while none of the respondents described it as “evidently visible”. Complete closure of the palpebral fissure at night was reported by 72.7% of the patients, while only 27.35% of the treated patients had to use other complimentary methods of globe protection against drying out.

The patients reported an appreciable decrease in pain (100%) and dryness sensation (64%). Half of the patients observed a decrease in conjunctiva



Fig. 4. Simultaneous upper eyelid loading with golden plate and lower eyelid and malar area lifting on fascia strip: a) before treatment with open eyes, b) before treatment with closed eyes, c) post treatment with open eyes, d) post treatment with closed eyes

Ryc. 4. Przykład jednoczesnego leczenia niedomykalności powieki górnej złotą płytką i podwieszenia tkanek policzka i powieki dolnej na paskach powięzi: a) przed operacją przy otwartych oczach, b) przed operacją przy zamkniętych oczach, c) po operacji przy otwartych oczach, d) po operacji przy zamkniętych oczach

irritation and redness. Lacrimation remained the only parameter which did not improve after the treatment.

None of the patients presented early complications. Three patients developed an inflammatory reaction to the golden plate (millesimal fineness 750) in 1 to 4 weeks from its implantation. The symptoms ceased after substitution of the implant with a platinum plate (2 cases) or golden plate of millesimal fineness 916 (1 case).

All the patients who had a golden plate implanted would be willing to undergo the same procedure in the future. Compared to conservative methods (lenses, ointments, “artificial tears”, taping) and other surgical procedures (temporary tarsorrhaphy), upper lid loading with a golden plate is regarded as “much better” (72.75%) or “better” (27.3%).

Discussion

In this paper the authors presented their experience in surgical treatment of lagophthalmos resulting from facial nerve paralysis. Many authors attest

to the advantages of lid loading over other surgical methods in the correction of lagophthalmos.

Metal implants inserted in the upper eyelid aid the closure of the palpebral fissure based on the force of gravity [9]. Among the various metals advocated by different authors, gold is the most widely used [2].

In case of an allergy to gold, platinum is used. The implants are plate-shaped and are either commonly available at standard shapes and dimensions or are custom-made. They may also be chain-like, which facilitates their adhesion to the curvature of the globe [11]. Some authors report implants with fenestration in their middle part, which would diminish pressure on the cornea and facilitate its ingrowth by surrounding tissues, thus reducing the risk of their migration [12].

Gold has many advantages in terms of implant preparation: biological inertness, color, malleability and a low percentage of allergic reactions [2].

The procedure is usually performed at some time distance from the occurrence of the face palsy symptoms. Some authors describe parotidectomy with simultaneous golden plate implantation [6]. Such a combined procedure, although logically

justified, in some cases requires refinement procedures [13].

Silver et al. [7] propose the use of thin platinum plates instead of traditional golden implants in order to optimize aesthetic results. In a group of 102 patients, they observed much better aesthetic results compared to “traditional” golden plates. Moreover, the implant extrusion rate was much lower in the discussed group and a fibrous capsule around the implant was produced less frequently.

Some authors emphasize the possibility of causing vision disorders (astigmatism) due to deformation of the cornea by a metal plate, which curvature varies from that of the eye globe [7]. Schrom et al. [11] propose the use of a chain-like platinum plate instead of traditional golden plate. In a group of 93 patients, they showed this method results in a lower percentage of implant extrusion, pain sensation and change of vision than the “traditional” golden implant. The functional and cosmetic results as well as lid closure were comparable in both groups.

The mass of the implants used by various authors ranged from 0.6 to 2.3 g. [5, 12–17]. The golden plates implanted in authors’ department ranged from 0.950 to 2.950 g. (average 1.755 g).

Among the alternative methods of lagophthalmos correction with use of alloplastic metals, upper eyelid metal spring implants are mentioned. Their advantage is the independence from gravity. According to Terzis et al., their result, however, is comparable to lid loading [18]. The disadvantage of this method is the frequent need for spring adjustment surgical procedures (up to 81% of the cases).

Another method, proposed by Bach et al. [8], is levator palpebrae muscle lengthening. The advantage of this method, especially if compared to alloplastic implants, is the lack of complications connected with the implant itself. The authors de-

scribe the effects as very good and point out the low complication rate.

In presented material, patients’ satisfaction rate after the procedure was comparable to that stated by other authors [11]. The patients reported not only better functional and aesthetic results, but they were also appreciated by their environment.

In the literature, the following complications are mentioned: hypercorrection of lagophthalmos (blepharoptosis) or residual lagophthalmos caused by improper mass of the implant leading to pseudoptosis of the upper eyelid, allergic reaction, infection, displacement or extrusion of the implant, thinning of the overlying muscle and skin [5], change of vision [11], keratitis, entropion resulting in trichiasis, eyelid distortion, corneal ulceration and scarring [2]. The final cosmetic effect may be influenced negatively by the visibility of the implant due to either excessive thickness of the plate or improper preparation and closure of the pocket [11].

The complication rate in presented material is significantly lower than presented by other authors: 10% versus 39% [18], 40% [5], 43.75% [11], 54.5% [6] and 66% [8]. In authors assessment, this fact may correlate with the appropriate fixation of the implant to the tarsal plate, which helps to avoid the most feared complication – implant extrusion, as well as careful preoperative determination of optimum implant size and weight.

Based on the results of the study and the patients’ opinions the authors concluded as follows. Lagophthalmos surgical correction by metal plate upper lid implantation is efficient and burdened with a low complication rate. The safety of the method is enhanced by its potential reversibility. It is easily combined with other surgical procedures in facial paralysis global treatment plans. Patients’ self-examination results have confirmed authors conclusions.

References

- [1] **Tuna SH, Gumus HO, Hersek N:** Custom-made Gold Implant for Management of Lagophthalmos: A Case Report. *Eur J Dent* 2008, 2, 294–298.
- [2] **Dalkiz M, Gokce HS, Aydin A, Beydemir B:** Gold weight implantation for rehabilitation of the paralysed eyelid. *Int J Oral Maxillofac Surg* 2007, 36, 522–526.
- [3] **Adams GG, Kirkness CM, Lee JP:** Botulinum toxin A induced protective ptosis. *Eye* 1987, 1, 603.
- [4] **Kirkness CM, Adams GG, Dilly PN:** Botulinum toxin A-induced protective ptosis in corneal disease. *Ophthalmology* 1988, 95, 473.
- [5] **Nunes TP, Sardinha M, Pereira IC:** Gold weight implantation: premature and late complications. *Arq Bras Oftalmol* 2007, 70, 599–602.
- [6] **Razfar A, Afifi AM, Manders EK:** Ocular outcomes after gold weight placement and facial nerve resection. *Otolaryngol Head Neck Surg* 2009, 140, 82–85.
- [7] **Silver AL, Lindsay RW, Cheney ML:** Thin-Profile Platinum Eyelid Weighting: A Superior Option in the Paralyzed Eye. *Plast Reconstr Surg* 2009, 6, 1697–1703.
- [8] **Bach CA, Raphael M, Krastinova D:** The paralysed eyelid: An alternative to gold weight, levator palpebrae lengthening. *Ann Chir Plast Esthet* 2009, 54, 37–44.
- [9] **Illig K:** Eine neue Operationsmethode gegen Lagophthalmus. *Klin Monatsbl Augenheilkd* 1958, 32, 410–411.
- [10] **Sheehan JE:** Progress in correction of facial palsy with tantalum wire and mesh. *Surgery* 1950, 27, 122.

- [11] **Schrom T, Buchal A, Ganswindt S, Knipping S:** Patient satisfaction after lid loading in facial palsy. *Eur Arch Otorhinolaryngol* 2009, 266, 1727–1731.
- [12] **Harrisberg BP, Singh RP, Croxson GR:** Long-term outcome of gold eyelid weights in patients with facial nerve palsy. *Otol Neurotol* 2001, 108, 1539–1543.
- [13] **Snyder MC, Johnson PJ, Moore GF:** Early versus late gold weight implantation for rehabilitation of the paralyzed eyelid. *Laryngoscope* 2001, 111, 2109–2113.
- [14] **Choo PH, Carter SR, Seiff SR:** Upper eyelid gold weight implantation in the Asian patient with facial paralysis. *Plast Reconstr Surg* 2000, 105, 855–859.
- [15] **Hontanilla B:** Weight measurement of upper eyelid gold implants for lagophthalmos in facial paralysis. *Plast Reconstr Surg* 2001, 108, 1539–1543.
- [16] **Kao CH, Moe KS:** Retrograde weight implantation for correction of lagophthalmus. *Laryngoscope* 2004, 114, 157–1575.
- [17] **Tower RN, Dailey RA:** Gold weight implantation: a better way? *Ophthal Plast Reconstr Surg* 2004, 20, 202–206.
- [18] **Terzis JK, Kyere SA:** Experience with the Gold Weight and Palpebral Spring in the Management of Paralytic Lagophthalmos. *Plast Reconstr Surg* 2008, 121, 806–815.

Address for correspondence:

Piotr Drozdowski
Jana Pawła II 2
57-320 Polanica-Zdrój
Poland
Tel. +48 692 040 080
E-mail: piotr_drozdowski@wp.pl

Conflict of interest: None declared

Received: 10.01.2011

Revised: 8.02.2011

Accepted: 5.10.2011

